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ABSTRACT

This Unified Sciences and Mathematics for Elementary Schools (USMES) unit challenges students to promote changes that will make eating in school more enjoyable. The challenge is general enough to apply to many problem-solving situations in mathematics, science, social science, and language arts at any elementary school level (grades 1-8). The Teacher Resource Book for the unit is divided into five sections. Section I describes the USMES approach to student-initiated investigations of real problems, including a discussion of the nature of USMES "challenges." Section II provides an overview of possible student activities with comments on prerequisite skills, instructional strategies, suggestions when using the unit with primary grades, flow charts illustrating how investigations evolve from students' discussions of an eating in school problem (focusing on eating environment, lunch line flow, and food), and a hypothetical account of intermediate-level class activities. Section III provides documented events of actual class activities from grades 4, 5, and 5/6. Section IV includes lists of "How To" cards and background papers, bibliography of non-USMES materials, and a glossary. Section V consists of charts identifying skills, concepts, processes, and areas of study learned as students become involved with the investigations. (JN)

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USMES

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Eating in School

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Teacher Resource Book

SE 039 069

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This book is a resource developed by the USMES Project: Earle L. Lomon, Project Director, Betty M. Beck, Associate Director for Development, Thomas L. Brown, Associate Director for Utilization Studies, Quinton E. Baker, Associate Director for Administration.

UNIFIED SCIENCES AND MATHEMATICS FOR ELEMENTARY SCHOOLS:
Mathematics and the Natural, Social, and Communications Sciences in Real Problem Solving.

Eating in School

First Edition

Education Development Center, Inc.
55 Chapel Street
Newton, MA 02160

Trial Edition

Originally published in 1973 as Lunch Lines
©1973, 1972, 1971, Education Development Center, Inc.

The present edition has been revised to include
other aspects of problems in lunchrooms

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CHALLENGE: PROMOTE CHANGES THAT WILL MAKE EATING IN SCHOOL MORE ENJOYABLE.

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Preface

The USMES Project

Unified Sciences and Mathematics for Elementary Schools: Mathematics and the Natural, Social, and Communications Sciences in Real Problem Solving (USMES) was formed in response to the recommendations of the 1967 Cambridge Conference on the Correlation of Science and Mathematics in the Schools.* Since its inception in 1970, USMES has been funded by the National Science Foundation to develop and carry out field trials of interdisciplinary units centered on long-range investigations of real and practical problems (or "challenges") taken from the local school/community environment. School planners can use these units to design a flexible curriculum for grades kindergarten through eight in which real problem solving plays an important role.

Development and field trials were carried out by teachers and students in the classroom with the assistance of university specialists at workshops and at occasional other meetings. The work was coordinated by a staff at the Education Development Center in Newton, Massachusetts. In addition, the staff at EDC coordinated implementation programs involving schools, districts, and colleges that are carrying out local USMES implementation programs for teachers and schools in their area.

Trial editions of the following units are currently available:

- Advertising
- Bicycle Transportation
- Classroom Design
- Classroom Management
- Consumer Research
- Describing People
- Designing for Human Proportions
- Design Lab Design
- Eating in School
- Getting There
- Growing Plants
- Manufacturing
- Mass Communications
- Nature Trails
- Orientation
- Pedestrian Crossings
- Play Area Design and Use
- Protecting Property
- School Rules
- School Supplies
- School Zoo
- Soft Drink Design
- Traffic Flow
- Using Free Time
- Ways to Learn/Teach
- Weather Predictions

*See Goals for the Correlation of Elementary Science and Mathematics, Houghton Mifflin Co., Boston, 1969.

USMES Resources

In responding to a long-range challenge, the students and teachers often have need of a wide range of resources. In fact, all of the people and materials in the school and community are important resources for USMES activities. In addition USMES provides resources for both teachers and students. A complete set of all the written materials comprise the USMES library, which should be available in each school using USMES units. These materials include--

1. *The USMES Guide*: This book is a compilation of materials that may be used for long-range planning of a curriculum that incorporates the USMES program. It describes the USMES project, real problem solving, classroom strategies, the Design Lab, the units, and the support materials as well as ways that USMES helps students learn basic skills.

2. *Teacher Resource Books* (one for each challenge): Each of these guides to using USMES units describes a broad problem, explains how students might narrow that problem to fit their particular needs, recommends classroom strategies, presents edited logs from teachers whose classes have worked on the unit, and contains charts that indicate basic skills, processes, and areas of study that students may learn and utilize.

3. *Design Lab Manual*: This guide helps teachers and administrators set up, run, and use a Design Lab--a place with tools and materials in which the students can build things they need for their work on USMES. A Design Lab may be a corner of a classroom, a portable cart, or a separate room. Because many "hands-on" activities may take place in the classroom, every USMES teacher should have a Design Lab Manual.

4. *"How To" Series*: These student materials provide information to students about specific problems that may arise during USMES units. The regular *"How To" Series* covers problems in measuring, graphing, data handling, etc., and is available in two versions--a series of

cartoon-style booklets for primary grades and a series of magazine-style booklets with more reading matter for upper grades. The *Design Lab "How To" Series* is available in two illustrated card versions--one for primary grades and one for upper grades. A complete list of the *"How To" Series* can be found in the *USMES Guide*.

5. *Background Papers*: These papers, correlated with the *"How To" Series*, provide teachers with information and hints that do not appear in the student materials. A complete list can be found in the *USMES Guide*.

6. *Curriculum Correlation Guide*: By correlating the twenty-six USMES units with other curriculum materials, this book helps teachers to integrate USMES with other school activities and lessons.

The preceding materials are described in brief in the USMES brochure, which can be used by teachers and administrators to disseminate information about the program to the local community. A variety of other dissemination and implementation materials are also available for individuals and groups involved in local implementation programs. They include *Preparing People for USMES: An Implementation Resource Book*, the USMES slide/tape show, the Design Lab slide/tape show, the Design Lab brochure, videotapes of classroom activities, a general report on evaluation results, a map showing the locations of schools conducting local implementation of USMES, a list of experienced USMES teachers and university consultants, and newspaper and magazine articles.

* * * * *

Because Tri-Wall was the only readily available brand of three-layered cardboard at the time the project began, USMES has used it at workshops and in schools; consequently, references to Tri-Wall can be found throughout the Teacher Resource Books. The addresses of suppliers of three-layered cardboard can be found in the Design Lab Manual.

Introduction

Using the Teacher Resource Book

When teachers try a new curriculum for the first time, they need to understand the philosophy behind the curriculum. The USMES approach to student-initiated investigations of real problems is outlined in section A of this Teacher Resource Book.

Section B starts with a brief overview of possible student activities arising from the challenge; comments on prerequisite skills are included. Following that is a discussion of the classroom strategy for USMES real problem-solving activities, including introduction of the challenge, student activity, resources, and Design Lab use. Subsequent pages include a description of the use of the unit in primary grades, a flow chart and a composite log that indicate the range of possible student work, and a list of questions that the teacher may find useful for focusing the students' activities on the challenge.

Because students initiate all the activities in response to the challenge and because the work of one class may differ from that undertaken by other classes, teachers familiar with USMES need to read only sections A and B before introducing the challenge to students.

Section C of this book is the documentation section. These edited teachers' logs show the variety of ways in which students in different classes have worked at finding a solution to the challenge.

Section D contains a list of the titles of relevant sets of "How To" Cards and brief descriptions of the Background Papers pertaining to the unit. Also included in section D is a glossary of the terms used in the Teacher Resource Book and an annotated bibliography.

Section E contains charts that indicate the comparative strengths of the unit in terms of real problem solving, mathematics, science, social science, and language arts. It also contains a list of explicit examples of real problem solving and other subject area skills, processes, and areas of study learned and utilized in the unit. These charts and lists are based on documentation of activities that have taken place in USMES classes. Knowing ahead of time which basic skills and processes are likely to be utilized, teachers can postpone teaching that part of their regular program until later in the year. At that time students can study them in the usual way if they have not already learned them as part of their USMES activities.

A. Real Problem Solving and USMES

*If life were of such a constant nature that there were only a few chores to do and they were done over and over in exactly the same way, the case for knowing how to solve problems would not be so compelling. All one would have to do would be to learn how to do the few jobs at the outset. From then on he could rely on memory and habit. Fortunately--or unfortunately depending upon one's point of view--life is not simple and unchanging. Rather it is changing so rapidly that about all we can predict is that things will be different in the future. In such a world the ability to adjust and to solve one's problems is of paramount importance.**

Real Problem Solving

USMES is based on the beliefs that real problem solving is an important skill to be learned and that many math, science, social science, and language arts skills may be learned more quickly and easily within the context of student investigations of real problems. Real problem solving, as exemplified by USMES, implies a style of education which involves students in investigating and solving real problems. It provides the bridge between the abstractions of the school curriculum and the world of the student. Each USMES unit presents a problem in the form of a challenge that is interesting to children because it is both real and practical. The problem is real in several respects: (1) the problem applies to some aspect of student life in the school or community, (2) a solution is needed and not presently known, at least for the particular case in question, (3) the students must consider the entire situation with all the accompanying variables and complexities, and (4) the problem is such that the work done by the students can lead to some improvement in the situation. This expectation of useful accomplishment provides the motivation for children to carry out the comprehensive investigations needed to find some solution to the challenge.

The level at which the children approach the problems, the investigations that they carry out, and the solutions

*Kenneth B. Henderson and Robert E. Pingry, "Problem-Solving in Mathematics," in *The Learning of Mathematics: Its Theory and Practice,* Twenty-first Yearbook of the National Council of Teachers of Mathematics (Washington, D.C.: The Council, 1953), p. 233.

The USMES Approach

that they devise may vary according to the age and ability of the children. However, real problem solving involves them, at some level, in all aspects of the problem-solving process: definition of the problem; determination of the important factors in the problem; observation; measurement; collection of data; analysis of the data using graphs, charts, statistics, or whatever means the students can find; discussion; formulation and trial of suggested solutions; clarification of values; decision making; and communications of findings to others. In addition, students become more inquisitive, more cooperative in working with others, more critical in their thinking, more self-reliant, and more interested in helping to improve social conditions.

To learn the process of real problem solving, the students must encounter, formulate, and find some solution to complete and realistic problems. The students themselves, not the teacher, must analyze the problem, choose the variables that should be investigated, search out the facts, and judge the correctness of their hypotheses and conclusions. In real problem-solving activities, the teacher acts as a coordinator and collaborator, not an authoritative answer-giver.

The problem is first reworded by students in specific terms that apply to their school or community, and the various aspects of the problem are discussed by the class. The students then suggest approaches to the problem and set priorities for the investigations they plan to carry out. A typical USMES class consists of several groups working on different aspects of the problem. As the groups report periodically to the class on their progress, new directions are identified and new task forces are formed as needed. Thus, work on an USMES challenge provides students with a "discovery-learning" or "action-oriented" experience.

Real problem solving does not rely solely on the discovery-learning concept. In the real world people have access to certain facts and techniques when they recognize the need for them. The same should be true in the classroom. When the students find that certain facts and skills are necessary for continuing their investigation, they learn willingly and quickly in a more directed way to acquire these facts and skills. Consequently, the students should have available different resources that they may use as they recognize the need for them, but they should still be left with a wide scope to explore their own ideas and methods.

Certain information on specific skills is provided by the sets of USMES "How To" Cards. The students are referred only to the set for which they have clearly identified a need and only when they are unable to proceed on their own. Each "How To" Cards title clearly indicates the skill involved--"How to Use a Stopwatch," "How to Make a Bar Graph Picture of Your Data," etc. (A complete list of the "How To" Cards can be found in Chapter IX of the USMES Guide.)

Another resource provided by USMES is the Design Lab or its classroom equivalent. The Design Lab provides a central location for tools and materials where devices may be constructed and tested without appreciably disrupting other classroom activities. Ideally, it is a separate room with space for all necessary supplies and equipment and work space for the children. However, it may be as small as a corner of the classroom and may contain only a few tools and supplies. Since the benefits of real problem solving can be obtained by the students only if they have a means to follow up their ideas, the availability of a Design Lab can be a very important asset.

Optimally, the operation of the school's Design Lab should be such as to make it available to the students whenever they need it. It should be as free as possible from set scheduling or programming. The students use the Design Lab to try out their own ideas and/or to design, construct, test, and improve many devices initiated by their responses to the USMES challenges. While this optimum operation of the Design Lab may not always be possible due to various limitations, "hands-on" activities may take place in the classroom even though a Design Lab may not be available. (A detailed discussion of the Design Lab can be found in Chapter VI of the USMES Guide, while a complete list of "How To" Cards covering such Design Lab skills as sawing, gluing, nailing, soldering, is contained in Chapter IX.)

Work on all USMES challenges is not only sufficiently complex to require the collaboration of the whole class but also diverse enough to enable each student to contribute according to his/her interest and ability. However, it should be noted that if fewer than ten to twelve students from the class are carrying out the investigation of a unit challenge, the extent of their discovery and learning can be expected to be less than if more members of the class are involved. While it is possible for a class to work on two related units at the same time, in many classes the students progress better with just one.

The amount of time spent each week working on an USMES challenge is crucial to a successful resolution of the

Importance of the Challenge

problem. Each challenge is designed so that the various investigations will take from thirty to forty-five hours, deperding on the age of the children, before some solution to the problem is found and some action is taken on the results of the investigations. Unless sessions are held at least two or three times a week, it is difficult for the children to maintain their interest and momentum and to become involved intensively with the challenge. The length of each session depends upon the age level of the children and the nature of the challenge. For example, children in the primary grades may proceed better by working on the challenge more frequently for shorter periods of time, perhaps fifteen to twenty minutes, while older children may proceed better by working less frequently for much longer periods of time.

Student interest and the overall accomplishments of the class in finding and implementing solutions to the challenge indicate when the class's general participation in unit activities should end. (Premature discontinuance of work on a specific challenge is often due more to waning interest on the part of the teacher than to that of the students.) However, some students may continue work on a voluntary basis on one problem, while the others begin to identify possible approaches to another USMES challenge.

Although individual (or group) discovery and student initiation of investigations is the process in USMES units, this does not imply the constant encouragement of random activity. Random activity has an important place in children's learning, and opportunities for it should be made available at various times. During USMES activities, however, it is believed that children learn to solve real problems only when their efforts are focused on finding some solution to the real and practical problem presented in the USMES challenge. It has been found that students are motivated to overcome many difficulties and frustrations in their efforts to achieve the goal of effecting some change or at least of providing some useful information to others. Because the children's commitment to finding a solution to the challenge is one of the keys to successful USMES work, it is extremely important that the challenge be introduced so that it is accepted by the class as an important problem to which they are willing to devote a considerable amount of time.

The challenge not only motivates the children by stating the problem but also provides them with a criterion for judging their results. This criterion--if it works, it's right (or if it helps us find an answer to our problem, it's

a good thing to do)--gives the children's ideas and results a meaning within the context of their goal. Many teachers have found this concept to be a valuable strategy that not only allows the teacher to respond positively to all of the children's ideas but also helps the children themselves to judge the value of their efforts.

Role of the Teacher

With all of the above in mind, it can be said that the teacher's responsibility in the USMES strategy for open classroom activities is as follows:

1. Introduce the challenge in a meaningful way that not only allows the children to relate it to their particular situation but also opens up various avenues of approach.

2. Act as a coordinator and collaborator. Assist, not direct, individuals or groups of students as they investigate different aspects of the problem.

3. Hold USMES sessions at least two or three times a week so that the children have a chance to become involved in the challenge and carry out comprehensive investigations.

4. Provide the tools and supplies necessary for initial hands-on work in the classroom or make arrangements for the children to work in the Design Lab.

5. Be patient in letting the children make their own mistakes and find their own way. Offer assistance or point out sources of help for specific information (such as the "How To" Cards) only when the children become frustrated in their approach to the problem. Conduct skill sessions as necessary.

6. Provide frequent opportunities for group reports and student exchanges of ideas in class discussions. In most cases, students will, by their own critical examination of the procedures they have used, improve or set new directions in their investigations.

7. If necessary, ask appropriate questions to stimulate the students' thinking so that they will make more extensive and comprehensive investigations or analyses of their data.

8. Make sure that a sufficient number of students (usually ten to twelve) are working on the challenge so that activities do not become fragmented or stall.

Student success in USMES unit activities is indicated by the progress they make in finding some solution to the challenge, not by following a particular line of investigation nor by obtaining specified results. The teacher's role in the USMES strategy is to provide a classroom atmosphere in which all students can, in their own way, search out some solution to the challenge.

USMES in the Total School Program

Today many leading educators feel that real problem solving (under different names) is an important skill to be learned. In this mode of learning particular emphasis is placed on developing skills to deal with real problems rather than the skills needed to obtain "correct" answers to contrived problems. Because of this and because of the interdisciplinary nature of both the problems and the resultant investigations, USMES is ideal for use as an important part of the elementary school program. Much of the time normally spent in the class on the traditional approaches to math, science, social science, and language arts skills can be safely assigned to USMES activities. In fact, as much as one-fourth to one-third of the total school program might be allotted to work on USMES challenges. Teachers who have worked with USMES for several years have each succeeding year successfully assigned to USMES activities the learning of a greater number of traditional skills. In addition, reports have indicated that students retain for a long time the skills and concepts learned and practiced during USMES activities. Therefore, the time normally spent in reinforcing required skills can be greatly reduced if these skills are learned and practiced in the context of real problem solving.

Because real problem-solving activities cannot possibly cover all the skills and concepts in the major subject areas, other curricula as well as other learning modes (such as "lecture method," "individual study topics," or programmed instruction) need to be used in conjunction with USMES in an optimal education program. However, the other

instruction will be enhanced by the skills, motivation, and understanding provided by real problem solving, and, in some cases, work on an USMES challenge provides the context within which the skills and concepts of the major subject areas find application.

In order for real problem solving taught by USMES to have an optimal value in the school program, class time should be apportioned with reason and forethought, and the sequence of challenges investigated by students during their years in elementary school should involve them in a variety of skills and processes. Because all activities are initiated by students in response to the challenge, it is impossible to state unequivocally which activities will take place. However, it is possible to use the documentation of activities that have taken place in USMES trial classes to schedule instruction on the specific skills and processes required by the school system. Teachers can postpone the traditional way of teaching the skills that might come up in work on an USMES challenge until later in the year. At that time students can learn the required skills in the usual way if they have not already learned them during their USMES activities.

These basic skills, processes, and areas of study are listed in charts and lists contained in each Teacher Resource Book. A teacher can use these charts to decide on an overall allocation of class time between USMES and traditional learning in the major subject disciplines. Examples of individual skills and processes are also given so that the teacher can see beforehand which skills a student may encounter during the course of his investigations. These charts and lists may be found in section E.

Ways In Which USMES Differs From Other Curricula

As the foregoing indicates, USMES differs significantly from other curricula. Real problem solving develops the problem-solving ability of students and does it in a way (learning-by-doing) that leads to a full understanding of the process. Because of the following differences, some teacher preparation is necessary. Some teachers may have been introduced by other projects to several of the following new developments in education, but few teachers have integrated all of them into the new style of teaching and learning that real problem solving involves.

1. New Area of Learning--Real problem solving is a new area of learning, not just a new approach or a new content within an already-defined subject area. Although many subject-matter curricula

include something called problem solving, much of this problem solving involves contrived problems or fragments of a whole situation and does not require the cognitive skills needed for the investigation of real and practical problems. Learning the cognitive strategy required for real problem solving is different from other kinds of learning.

3. Interdisciplinary Education--Real problem solving integrates the disciplines in a natural way; there is no need to impose a multi-disciplinary structure. Solving real and practical problems requires the application of skills, concepts, and processes from many disciplines. The number and range of disciplines are unrestricted and the importance of each is demonstrated in working toward the solution of practical problems.

3. Student Planning--To learn the process of problem solving, the students themselves, not the teacher, must analyze the problem, choose the variables that should be investigated, search out the facts, and judge the correctness of the hypotheses and conclusions. In real problem-solving activities the teacher acts as a coordinator and collaborator, not as an authoritative source of answers.

4. Learning-by-Doing--Learning-by-doing, or discovery learning as it is sometimes called, comes about naturally in real problem solving since the problems tackled by each class have unique aspects; for example, different lunchrooms or pedestrian crossings have different problems associated with them and, consequently, unique solutions. The challenge, as defined in each situation, provides the focus for the children's hands-on learning experiences, such as collecting real data; constructing measuring instruments, scale models, test equipment, etc.; trying their suggested improvements; and (in some units) preparing reports and presentations of their findings for the proper authorities.

5. Learning Skills and Concepts as Needed--Skills and concepts are learned in real problem solving

as the need for them arises in the context of the work being done, rather than having a situation imposed by the teacher or the textbook being used. Teachers may direct this learning when the need for it arises, or students may search out information themselves from resources provided.

6. Group Work--Progress toward a solution to a real problem usually requires the efforts of groups of students, not just individual students working alone. Although some work may be done individually, the total group effort provides good opportunities for division of labor and exchange of ideas among the groups and individuals. The grouping is flexible and changes in order to meet the needs of the different stages of investigation.

7. Student Choice--Real problem solving offers classes the opportunity to work on problems that are real to them, not just to the adults who prepare the curriculum. In addition, students may choose to investigate particular aspects of the problem according to their interest. The variety of activities ensuing from the challenge allows each student to make some contribution towards the solution of the problem according to his or her ability and to learn specific skills at a time when he or she is ready for that particular intellectual structure.

B. General Papers on Eating in School

1. OVERVIEW OF ACTIVITIES

Challenge:

Promote changes that will make eating in school more enjoyable.

Possible Class Challenges:

How can we make the lunchroom more attractive (less noisy)?

Promote changes that will reduce the time we spend waiting in the lunch line.

How can we improve the food served for lunch (breakfast, snack)?

The lunch and breakfast periods at school have long been sources of student comments and criticism. Complaints usually focus on the lunchroom itself--noise, poor decor, unpopular or inefficient table arrangements, time spent waiting in line, quality of service, or the food. Whatever the problem(s) may be, students usually respond readily to a challenge to make one of their favorite activities--eating--more enjoyable.

Complaints connected with lunch, breakfast, or snack periods may arise naturally after an unpleasant circumstance, such as a particularly unpopular meal or a long wait in line. In other classes, the teacher needs merely to ask, "How was lunch (or breakfast) today?" and a lively discussion will evolve. Sometimes an Eating in School problem may be identified after the class has worked on a related USMES challenge, such as School Rules.

The children may list several problems they have experienced while eating at school. These problems may be related to environmental aspects of the lunchroom, such as furniture arrangement, student behavior, decor, noise, lighting, and temperature. Other problems may be related to nutritional aspects, such as food quality, food quantity, food appearance, student food preferences, server behavior, wasted foods, and storage of cold lunches. Eating or waiting time is a third important issue; problems of scheduling, arrangement of seats or serving tables, and systems of filing in and out of the lunchroom may be discussed by the class.

The children may decide to observe lunch or breakfast periods for a few days in order to gather more information. The class may then identify the most urgent problems and choose to limit their activities to these at first.

The class may divide into groups to work on the challenge. In order to have evidence that a problem exists, they may collect data, such as the amount of time it takes a student to get through the line, noise levels in the lunchroom, the number of students eating lunch or breakfast during each time period, the kinds of foods students throw out, or the way food is laid out and served. Since the lunchroom is used by the whole school, the students may conduct opinion surveys to determine preferences for foods or lunchroom decorations or to record additional criticisms. Data col-

Washington School
427 Darrow Ave
Plainfield, N. J.
February 10, 1976

Dear Mrs. Elizabeth Chitty,

Washington School would like to have hot lunches. Room 202 is trying to get hot lunches. It is getting very cold outside. We still have those cold lunches. Other schools have hot lunches. So why can't we have hot lunches too? We want them very badly. We would appreciate it if we got hot lunches. Will you please come and taste all the different kinds of sandwiches?

Sincerely,
Room 202

Barbara Briggs, Grades 4-5

lected through observations, tallies, and surveys is graphed in preparation for a presentation to the rest of the class and school authorities. Children may make scale maps or models of the lunchroom to help them understand and criticize present systems of furniture arrangement or lunch line flow.

The class examines charts and graphs made from their data and discusses student observations before recommending specific changes. Recommendations may take the form of suggesting different menus based on their food preference survey and nutritional requirements, or they may involve systems for rerouting the lunch line or reorganizing lunchroom furniture or the serving tables. To help them work out alternative arrangements, the children might use scale models of the lunchroom with cardboard cutouts of tables, benches, or eating ware dispensers that can be placed in various positions. Many revisions of proposed changes may take place before the children are ready to present their new plans.

When they are satisfied with their changes, the children present their recommendations to the principal, cafeteria staff, faculty, or student body. They may ask for a trial implementation period in order to assess the effectiveness of their plans. If this period is granted, the children collect data to compare with previous results. Revisions are once again made before the plan is put into effect.

The students' interest in improving eating in school may lead them to investigate related problems. If their investigations of food served in the cafeteria have interested them in quality of commercial products, they may be motivated to pursue a Consumer Research challenge.

Although many of these activities may require skills and concepts new to the children, there is no need for preliminary work on these skills and concepts because the children can learn them when the need arises. In fact, children learn more quickly and easily when they see a need to learn. Consider counting: whereas children usually count by rote, they can, through USMES, gain a better understanding of counting by learning or practicing it within real contexts. In working on Eating in School, children also learn and practice graphing, measuring, working with decimals, and dividing. Although dividing seems necessary to compare fractions or ratios, primary children can make comparisons graphically or by subtracting medians (half-way values). Furthermore, instead of using division to make scale drawings, younger children can convert their measurements to spaces on graph paper. Division may be introduced during calculation of percentages, averages, or food costs per unit.

2. CLASSROOM STRATEGY FOR EATING IN SCHOOL

Each USMES unit revolves around a challenge--a statement that says, "Solve this problem." The success or failure of the unit depends largely on (1) the relevance of the problem for the students and (2) the process by which they define and accept the challenge. If the children see the problem as a real one, they will be committed to finding a solution; they will have a focus and purpose for their activities. If the students do not think the problem affects them, their attempts at finding solutions will likely be disjointed and cursory.

The Eating in School challenge--"Promote changes that will make eating in school more enjoyable"--is general enough to apply to many situations. Students in different classes define and reword the challenge to fit the particular problems of their school and thus arrive at a specific class challenge. "Find the best way to reduce the amount of time spent waiting in the lunch line" might be the challenge for a class in which the children complain about long lines in the cafeteria.

The Process of Introducing the Challenge

Given that a problem exists, how can a teacher, without being directive, help the students identify the challenge that they will work on as a group? There is no set method because of variations among teachers, classes, and schools and among the USMES units themselves. However, USMES teachers have found that certain general techniques in introducing the challenge are helpful.

One such technique is to turn a discussion of some recent event toward an Eating in School challenge. For example, the teacher might simply ask the children how they felt about school lunches or breakfasts, and a variety of complaints will surface. The teacher may then ask the children what they think can be done about the problems they have identified.

A combined fifth- and sixth-grade class began working on Eating in School when the teacher asked the children if they liked school breakfast that morning. The children listed various complaints. Over the next few days, more problems were discussed and the teacher asked the children if they thought they could help the school breakfast program run more smoothly. The children discussed ways in which they felt the program could be improved, such as by conducting a food preference survey and serving only popular items.

Frequently, the children will volunteer complaints about the quality of the food or other lunchtime problems, providing an opportunity for the teacher to introduce an Eating in School challenge.

An Eating in School challenge may arise from the children's work on another USMES unit. For example, children working on School Rules might decide to work on rules in the lunchroom. As they examine lunchtime rules and behavior, they may decide that other aspects of lunch--e.g., lunchroom environment or food--need changing.

When children working on another USMES challenge encounter a problem that leads to an Eating in School challenge, one group of children may begin work on this second challenge while another continues on the first. However, there should be at least ten or twelve students working on any one challenge; otherwise the children's work may be fragmented or superficial or may break down completely.

The Eating in School challenge may also evolve during a discussion of a specific topic being studied by the class. A class studying nutrition may become interested in improving the nutritional quality of school lunch or breakfast.

Sometimes the discussion of a broad problem may encompass the challenges of several related units. For example, a discussion of problems in the school could lead to Eating in School, Classroom Management, Classroom Design, School Rules, or Getting There, depending on which problems the children identify.

An experienced USMES teacher is usually willing to have the children work on any one of the several challenges that may arise during the discussion of a broad problem. While this approach gives the children the opportunity to select the challenge they are most interested in investigating, it does place on the teacher the additional responsibility of being prepared to act as a resource person for whichever challenge is chosen.

Classroom experience has shown that children's progress on an Eating in School challenge may be poor if the teacher and students do not reach a common understanding of what the challenge is before beginning work on it. Having no shared focus for their work, the children will lack the motivation inherent in working together to solve a real problem. As a result, they may quickly lose interest.

A similar situation occurs if the teacher, rather than ensuring that the children have agreed upon a challenge, merely assigns a series of activities. Although the teacher may see how these activities relate to an overall goal, the children may not.

Initial Work on the Challenge

Once a class has decided to work on an Eating in School challenge, USMES sessions should be held several times a week, but they need not be rigidly scheduled. When sessions are held after long intervals, students often have difficulty remembering exactly where they were in their investigations and their momentum diminishes.

During the initial session, children list lunchroom problems, and the list usually is long. By lumping together similar complaints and by choosing only a few major problems to work on at first, the class can arrive at a manageable challenge. If the students try to tackle too many problems at once, their investigations will be superficial.

In a combination third/fourth/fifth-grade class students were asked if they could find a way to improve eating in the lunchroom. The children made lists of the things they disliked in the lunchroom. However, instead of categorizing the problems and choosing the most serious, they divided into groups to work on all nine of them. Work on the challenge was fragmented and the children lost interest before they could obtain results.

Once they have agreed upon which problems in the lunchroom need to be worked on immediately, the children suggest approaches to solving them. Next, they categorize their suggestions for improvements, list the tasks necessary to carry out their ideas, and set priorities for these tasks. Most of these tasks are carried out by small groups of children.

Children in one fifth-grade class began observing during lunch period to find out if there were any serious problems in the lunchroom. They made a chart of their observations and decided to focus their attention on speeding up the lunch lines. They divided into groups to work on collecting data. One group timed students passing through the lunch line, another group observed the milk line, and a third worked on comparing the morning lunch count with a tally of the number of students in the lunch line.

As various groups complete their work, their members join other groups or form new groups to work on additional tasks. However, if too many groups are formed, work on the challenge can become fragmented. The teacher finds it impossible to be aware of the progress and problems of each group; in addition, the small number of students in each group lessens the chance of varied input and interaction.

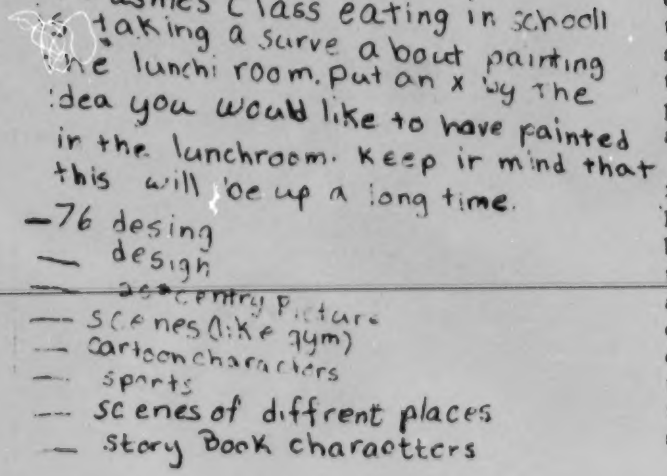
Refocusing on the Challenge

As children work on an Eating in School challenge, the children's attention should, from time to time, be refocused on that challenge so that they do not lose sight of their overall goal. Teachers find it helpful to hold periodic class discussions that include group reports on their investigations of lunchroom problems. Such sessions help the students review what they still need to do in order to recommend improvements. These discussions also provide an opportunity for students to evaluate their own work and exchange ideas with their classmates. Without these sessions there is a strong possibility that the children's efforts will overlap unnecessarily.

In one sixth-grade class, the teacher introduced the Eating in School challenge and the children listed problems in the lunchroom that they felt could be improved. However, when the children divided into groups there was considerable disorganization and duplication of effort. When the teacher finally held a class discussion so that the groups could report on their activities, the children realized their error and regrouped. A few of the new groups benefited by this discussion and some progress on the challenge was made.

Resources for Work on the Challenge

During the course of an USMES unit, a teacher may feel that the children are taking a wrong approach, and he or she is faced with the question: Should I interfere? If the teacher feels that the direction in which the children are leading is legally or morally unsound, he or she has the option to intervene. For instance, if children working on Eating in School decide to videotape the cafeteria to find out which children are misbehaving, a teacher might be inclined to forbid the students to carry out their plans. However, before the teacher speaks out, the children themselves might question the fairness of this activity.



Sandra Aken, Grades 4, 5, 6

In one sixth-grade class the children held a heated discussion on whether they should take a survey to find out other students' perceptions of lunchroom problems or to videotape the lunchroom and identify the problems from the tape. The video supporters also wanted to use the film to find out which students misbehaved. One student in particular objected to this tactic, saying "We're not going to get other kids in trouble!" Although the whole class did not see it as a "right to privacy" issue, they agreed that it would be better to take a survey. The teacher's role was limited to keeping the discussion on the track and to summarizing the opposing points of view.

If the children do not recognize a moral or legal conflict on their own, the teacher might ask questions that stimulate the children to think about their values and sense of responsibility to others. For example, a teacher might ask the children how they would feel if another class had the power to record their behavior on film and to evaluate their actions.

The technique of asking open-ended questions is also useful when children encounter other difficulties during their Eating in School investigations or try to decide on solutions before collecting enough data. These questions stimulate the children to think more comprehensively and creatively about their work. For example, instead of telling the children that their plan to rearrange the lunchroom will need data to support it, the teacher might ask how they can prove that a problem exists. Examples of other non-directive, thought-provoking questions are given at the end of this section.

The teacher may also refer to the "How To" Cards relating to Eating in School for information about specific skills, such as using a stopwatch or drawing graphs. If many students or even the entire class need help in particular areas such as taking a survey or finding averages, teachers should conduct skill sessions as these needs arise. (Background Papers on topics relating to Eating in School activities may be helpful.)

USMES teachers can also assist students by making it possible for them to carry out tasks involving hands-on activities. If the children's tasks require them to design and construct items, such as scale models of the lunchroom,

the teacher should make sure that they have access to a Design Lab--any collection of tools and materials kept in a central location (in part of the classroom, on a portable cart, or in a separate room). A more detailed description of the Design Lab may be found in the USMES Guide.

Valuable as it is, a Design Lab is not necessary to begin work in Eating in School. The Design Lab is used only when needed, and, depending on the investigations chosen by the children, the need may not arise at all.

A fifth-grade class worked successfully on Eating in School without using the Design Lab. They collected data on how many children forgot their silverware, how much time children spent in the lunch lines, how long it took students to buy milk, and how many cartons of milk were sold and compared the number of people in the morning count with the number who actually bought lunch. They also interviewed the cafeteria staff and the district business manager. The class presented their recommendations to the principal and made posters to remind students in the lunchrooms to pick up their silverware and to watch their behavior. When the changes were implemented, the students collected fresh data to compare with their original data.

To carry out construction activities in schools without Design Labs, students may scrounge or borrow tools and supplies from parents, local businesses, or other members of the community. The extent to which any Design Lab is used varies with different classes because the children themselves determine the direction of the Eating in School investigations.

Culminating Activities

Student investigations on Eating in School generally continue until the children have agreed upon and recommended some solution for their problem. Once they have chosen their solution(s)--changes in the menu based on a food preference survey, new cafeteria rules, different furniture arrangements or placement of items in the lunch line--they may present their data to the principal or cafeteria supervisor and ask that certain changes be made. If their problem relates to lunchroom environment, they may paint a mural or install sound-absorbing materials on the cafeteria walls.

After the students have implemented their solution, they evaluate the effects of their changes by observing, by measuring, or by conducting attitude surveys.

In one fifth-grade class children chose four solutions to a problem of noise in the cafeteria--putting up posters, playing music, playing cartoons, and conducting a quiet contest. They tested each solution for a week with a VU-meter on a tape recorder and found that the solution of playing cartoons during lunch time kept the lunchroom the quietest. They continued to implement this solution during the remainder of the year.

3. USE OF EATING IN SCHOOL IN THE PRIMARY GRADES

Like older children, students in the primary grades may make many and varied complaints about the food or eating environment at school. They may feel that the food in the cafeteria is poor or that the lunchroom is unattractive or noisy. Children in one second-grade class decided that their lunchroom was ugly and in need of some kind of decoration. Other complaints may be that the line is too long or that rowdy individuals hold up the line or annoy people.

When these and other problems are discussed, the children choose the ones that seem most important and try to find solutions. A class of second-graders observed that many students ran in the cafeteria and decided to make a papier-mache model holding a sign reminding everyone of lunchroom rules. A kindergarten class decided to make snacks in school and voted to find out what foods were liked by everyone. Although more than one problem may be identified, primary classes may find it easier to work on only one Eating in School challenge at a time.

At some time during work on the challenge, young children might need to take a simple survey to find out if the problem is real to other students or to identify preferences for solutions. This survey may be a simple checklist of foods or lunchroom decorations liked or disliked or a list of questions with yes/no answers. Within a class, the survey may be a vote. In the kindergarten class each student voted on a snack by adding a plastic cube to a "yes" tower or a "no" tower.

Counting skills are learned as students tally answers from preference surveys or numbers of children eating lunch or standing in line. The children in the second-grade class counted numbers of children running in the lunchroom.

Primary children are capable of making many kinds of measurements while working on an Eating in School challenge. They may learn how to use a stopwatch to time children passing through the lunch line. This activity adds a new dimension to the standard lesson of telling time from clocks. They may also use metersticks or lengths of string to measure distances in the lunchroom or serving line to check if their suggestions for rearranging furniture or eating ware are feasible. If they are making their own snack, the children will learn to measure ingredients of recipes. The children in the kindergarten class made up their own recipe for popcorn by weighing the ingredients on a balance and using metal bolts as a standard weight.

Graphing is a simple activity for primary children to learn. The children in the kindergarten class laid their towers of plastic cubes on paper and drew around them to make a bar graph. In this way they documented that no one objected to having popcorn as a snack, as there were no cubes in the "no" column. Children might also graph numbers of children eating in the lunchroom, the amount of time it took each class to get through the lunchline or to receive their milk in the morning, etc.

Young children practice language skills when they report to the class on what they have done, make up surveys, follow recipes, or make posters of rules in the cafeteria. They may also write their recommendations to the principal or cafeteria staff as a culminating activity of the unit. Artistic talent, usually strong in young children, may be exercised if they decide to decorate cafeteria walls to make them brighter and more attractive.

4. FLOW CHART

The following flow chart presents some of the student activities--discussions, observations, calculations, constructions--that may occur during work on the Eating in School challenge. Because each class will choose its own approach to the challenge, the sequences of events given here represent only a few of the many possible variations.

Furthermore, no one class is expected to undertake all the activities listed.

The flow chart is not a lesson plan and should not be used as one. Instead, it illustrates how comprehensive investigations evolve from the students' discussion of an Eating in School problem.

Challenge: Promote changes that will make eating in school more enjoyable.

Optional Preliminary Activities:

LSMES Units:
- *Classroom Management*
- *School Rules*
- *Classroom Design*

Study of Nutrition

Possible Student Activities:

Class Discussion: How do you feel about eating in school? What do you like and what do you dislike about it? What aspects of eating lunch, breakfast, or snacks can be improved? How could we make eating more enjoyable?

Data Collection: Observation of lunchroom or snacktime routine--lunch line flow, table arrangement, lunchroom environment, daily menu, and student response, etc.

Data Collection: Survey of other children to determine critical problems with eating in school.

Data Representation: Bar graph of survey results.

Class Discussion: Interpretation of graphs. Reporting on observations. Which problems seem to be the most critical? Can we do anything to help eliminate them? How can we group problems so they will be easier to tackle? Formation of groups to work on problems.

Eating environment (See Flow Chart A)

Lunch line flow (See Flow Chart B)

Food (See Flow Chart C)

Class Discussion: Have our changes improved eating in school? How have they made a difference? How can we find out how much difference they have made?

Data Collection: Observations and measurements of time spent in lines, food wasted, noise level, etc.

Data Collection: Opinion survey to determine student opinions on changes.

Data Representation: Tally of survey results. Preparation of bar graphs, line charts, etc.

Class Discussion: What revisions need to be made? What other changes can we make to improve eating in school?

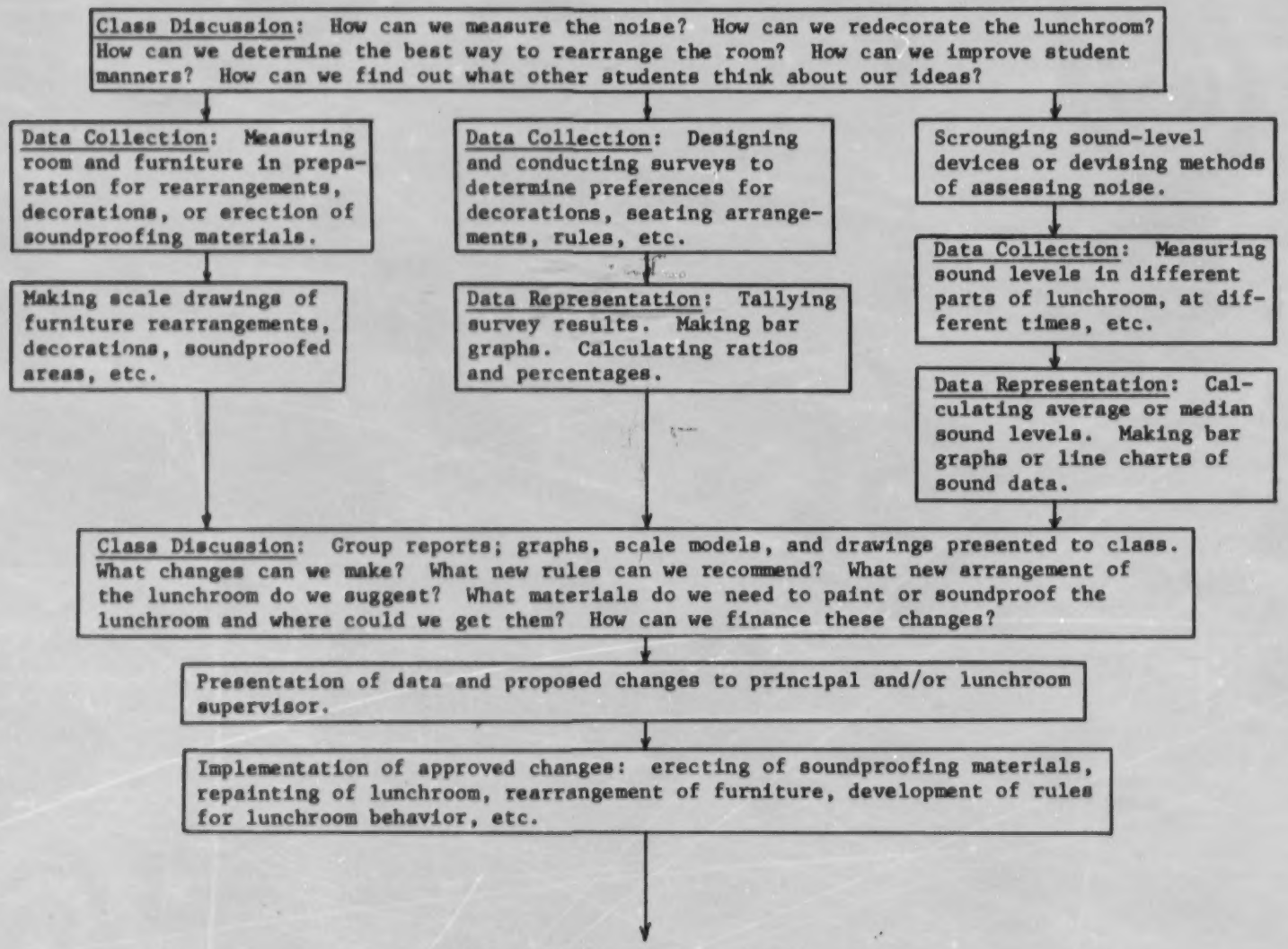
Optional Follow-Up Activities:

USMES Units:
- *Play Area Design and Use*
- *Consumer Research*
- *Soft Drink Design*

Study of Nutrition

FLOW CHART A

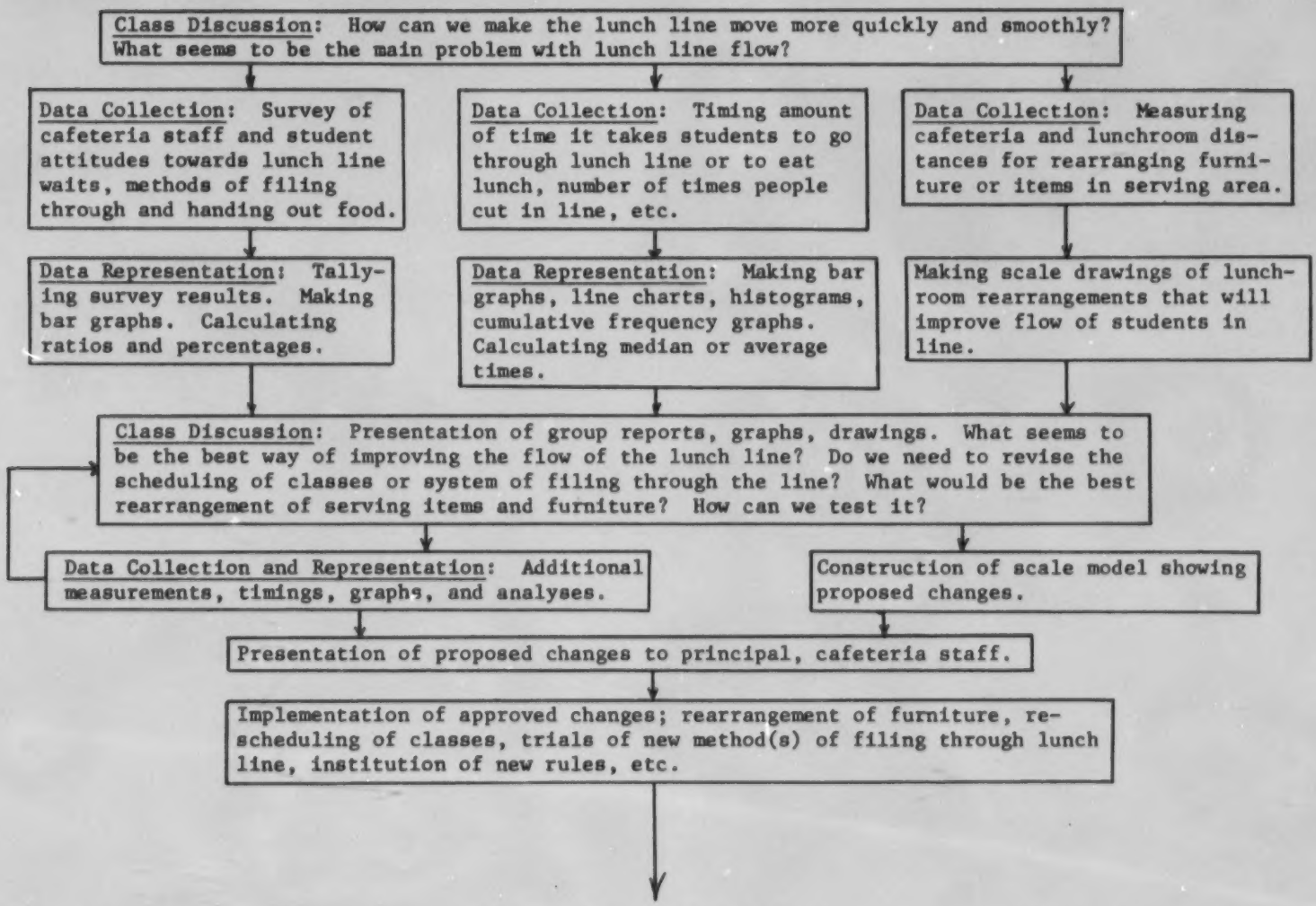
Eating Environment


Class Discussion: How can we measure the noise? How can we redecorate the lunchroom? How can we determine the best way to rearrange the room? How can we improve student manners? How can we find out what other students think about our ideas?
Data Collection: Measuring room and furniture in preparation for rearrangements, decorations, or erection of soundproofing materials.
Making scale drawings of furniture rearrangements, decorations, soundproofed areas, etc.
Data Collection: Designing and conducting surveys to determine preferences for decorations, seating arrangements, rules, etc.
Data Representation: Tallying survey results. Making bar graphs. Calculating ratios and percentages.
Scrounging sound-level devices or devising methods of assessing noise.
Data Collection: Measuring sound levels in different parts of lunchroom, at different times, etc.
Data Representation: Calculating average or median sound levels. Making bar graphs or line charts of sound data.
Class Discussion: Group reports; graphs, scale models, and drawings presented to class. What changes can we make? What new rules can we recommend? What new arrangement of the lunchroom do we suggest? What materials do we need to paint or soundproof the lunchroom and where could we get them? How can we finance these changes?
Presentation of data and proposed changes to principal and/or lunchroom supervisor.
Implementation of approved changes: erecting of soundproofing materials, repainting of lunchroom, rearrangement of furniture, development of rules for lunchroom behavior, etc.

(Return to main flow chart.)

FLOW CHART B

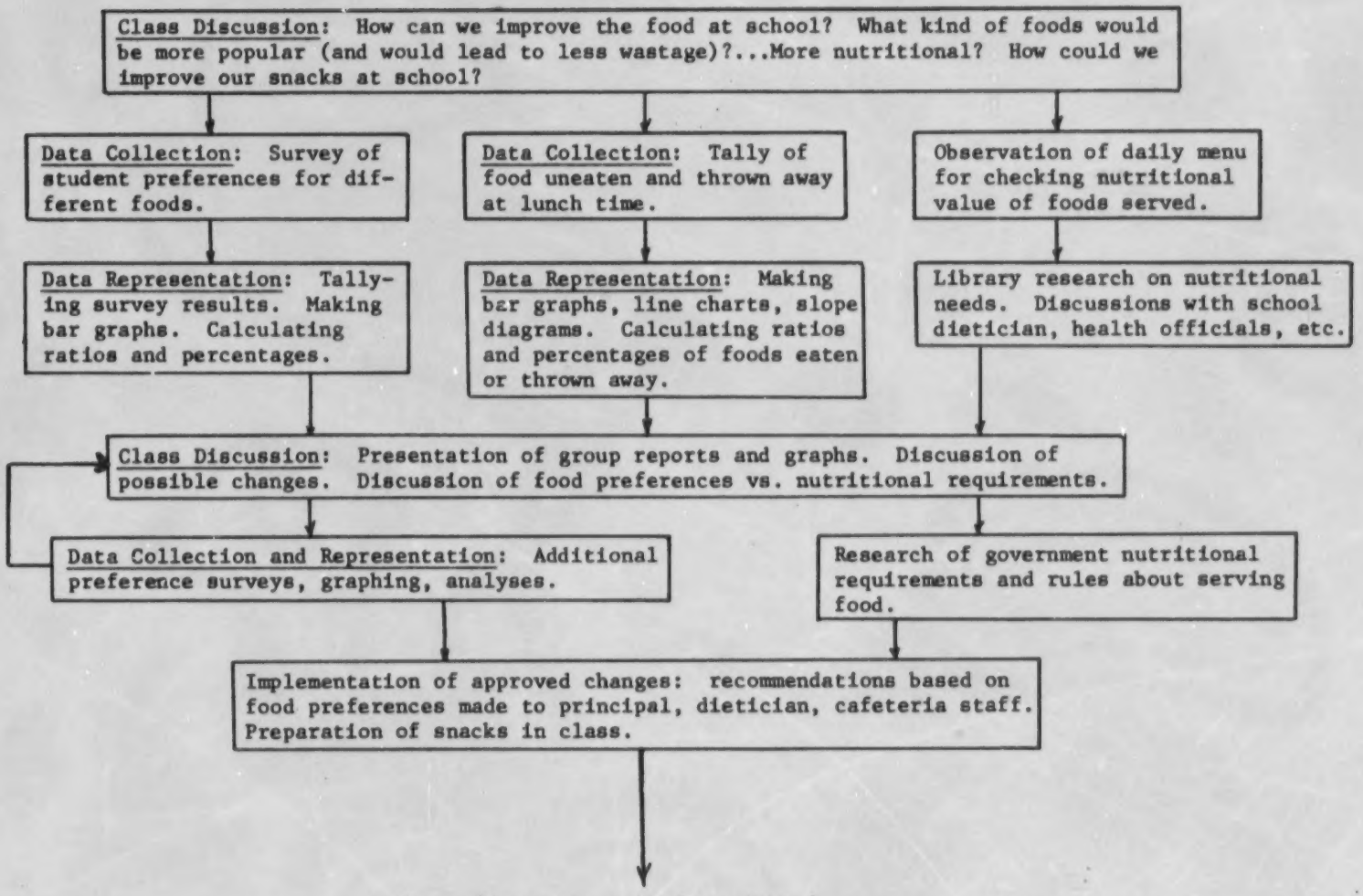
Lunch Line Flow


Class Discussion: How can we make the lunch line move more quickly and smoothly? What seems to be the main problem with lunch line flow?
Data Collection: Survey of cafeteria staff and student attitudes towards lunch line waits, methods of filing through and handing out food.
Data Collection: Timing amount of time it takes students to go through lunch line or to eat lunch, number of times people cut in line, etc.
Data Collection: Measuring cafeteria and lunchroom distances for rearranging furniture or items in serving area.
Data Representation: Tallying survey results. Making bar graphs. Calculating ratios and percentages.
Data Representation: Making bar graphs, line charts, histograms, cumulative frequency graphs. Calculating median or average times.
Making scale drawings of lunchroom rearrangements that will improve flow of students in line.
Class Discussion: Presentation of group reports, graphs, drawings. What seems to be the best way of improving the flow of the lunch line? Do we need to revise the scheduling of classes or system of filing through the line? What would be the best rearrangement of serving items and furniture? How can we test it?
Data Collection and Representation: Additional measurements, timings, graphs, and analyses.
Construction of scale model showing proposed changes.
Presentation of proposed changes to principal, cafeteria staff.
Implementation of approved changes; rearrangement of furniture, rescheduling of classes, trials of new method(s) of filing through lunch line, institution of new rules, etc.

(Return to main flow chart.)

FLOW CHART C

Food


Class Discussion: How can we improve the food at school? What kind of foods would be more popular (and would lead to less wastage)?...More nutritional? How could we improve our snacks at school?
Data Collection: Survey of student preferences for different foods.
Data Collection: Tally of food uneaten and thrown away at lunch time.
Observation of daily menu for checking nutritional value of foods served.
Data Representation: Tallying survey results. Making bar graphs. Calculating ratios and percentages.
Data Representation: Making bar graphs, line charts, slope diagrams. Calculating ratios and percentages of foods eaten or thrown away.
Library research on nutritional needs. Discussions with school dietician, health officials, etc.
Class Discussion: Presentation of group reports and graphs. Discussion of possible changes. Discussion of food preferences vs. nutritional requirements.
Data Collection and Representation: Additional preference surveys, graphing, analyses.
Research of government nutritional requirements and rules about serving food.
Implementation of approved changes: recommendations based on food preferences made to principal, dietician, cafeteria staff. Preparation of snacks in class.

(Return to main flow chart.)

5. A COMPOSITE LOG*

This hypothetical account of an intermediate-level class describes many of the activities and discussions mentioned in the flow charts. The composite log shows only one of the many progressions of events that might develop as a class investigates the Eating in School challenge. Documented events from actual classes are italicized and set apart from the text.

During the first few days of school, a teacher encourages the children in his fifth-grade class to discuss the experiences they have had at school and the things they feel might be improved. The children list several rules that they don't like, the problem of getting to class on time, and the "ugliness" of the school building. The conversation focuses on lunch period as children complain that the lunchroom is dingy, "the food is rotten," and kids are "really rude and messy." The teacher asks them if they can make their complaints more specific, and begins listing them on the board as the children talk:

1. Poor food--everybody throws a lot of it away
2. Noisy and rude kids
3. No decoration--the walls are ugly
4. The line could move a little faster
5. We shouldn't be forced to take food we don't want
6. They should serve pizza and hamburgers a lot
7. Not so many "icky" vegetables

As the list grows, the teacher points out that most of the items relate to the hot lunch served in the cafeteria. "Is that the most important problem?" he asks. Most of the children agree that the poor food is the most serious of the lunch problems. The teacher then asks if they would like to try to improve the food at school, and the class responds enthusiastically.

A teacher in a fifth- and sixth-grade class in Lansing, Michigan, asked the children how they felt about the breakfasts served by the federally-funded breakfast programs. The children made a long list of complaints--the juice was terrible, the milk ran out, the place was a mess, the place was too noisy, etc. They added to this list over the next few days. At the teacher's suggestion, the children accepted the responsibility for running the program themselves. (See log by Kathryn McNenly.)

*Written by USMES staff

Children in a fourth- and fifth-grade class in Athens, Georgia, listed around twenty complaints about eating in school. The class grouped all the problems together that they felt were related, and arrived at six broad categories. Because some of the problems seemed to fit in more than one category, the teacher took this opportunity to give a skill session in sets and Venn diagrams, using the eating in school problems as an example. They mapped the sets, showing overlapping areas. The children decided to ask the dietician and other children in the school to handle two of the problem areas and to divide into groups to tackle the remaining four. (From log by Marion Perkins.)

During the next few days, the children observe the lunchroom informally to find out if the food seems to be a problem for other children in the school. They write down comments and criticisms that they overhear while the food is being served, keep track of daily menus, and observe food waste when the lunch trays are returned.

When the class meets again for an USMES session, the children share their observations. They agree that the comments from other children have been generally unfavorable. Hot lunch eaters complained particularly about the vegetables ("Ugh! Spinach again!") but also about the main dish and everything else on the menu. The only day when the children heard a large number of favorable remarks was on Wednesday, when hamburgers were served.

In the discussion that follows, several students raise questions about the lunch program that need to be answered, such as "Why do they make us take *everything*, even food we don't like?" or "Who makes up these menus, anyway?" Two children volunteer to find the answers to these questions, and the class decides to form a research group to interview the principal and cafeteria staff about food requirements.

In the Lansing class, the students decided that they did not have enough information about how the breakfast program was run. They decided to invite the principal to talk with them about food ordering, handling money, placing long-range orders, and dealing with various problems. When the principal

came to the class, he gave a brief account of the history of the breakfast program before answering their questions. (See log by Kathryn McNenly.)

The teacher asks them what other things need to be done. "How can you prove to the people responsible that the menus need to be improved?" he questions. One girl suggests that they take a written survey of everyone who eats lunch to find out what people think about the food that is served. The class decides to form a second group to work on this task.

One boy who noticed a great deal of food being thrown away suggests that they keep records of the kinds and amounts of food waste. When several children agree that this is a good way to prove to Mr. Hatcher (the principal) that "people don't like the food," a third group forms to collect data on food wastage.

When the teacher asks what other tasks they need to work on, one girl mentions that she is concerned about the nutritional value of the food served. She also feels that it would be important to "make sure the foods we recommend are good for you." She wants to form a nutrition group, but many children feel that the group inquiring about menus and hot lunch requirements will be able to find out about nutritional needs as well. The class decides to make this another task of the rules and menus group and to call it, simply, the Research Group.

Students in a fifth-grade class in Monterey, California, discussed problems they had noticed in the school lunch line. They observed both lunch periods for two days and made a chart of their observations. When it appeared that students were waiting too long in the hot lunch and the milk lines and that the morning lunch count did not correspond with the number of lunches sold, they divided into three groups to work on these problems. Children within each group then collected data for their specific purposes. (From log by Pamela Fazzini.)

During the next several weeks, the children work in their groups collecting data or researching information. The teacher acts as a resource person for different groups, but

the children also meet frequently as a class to report on their progress and to ask for help from the other children.

The children in the group recording food wastage decide to count the amount of each item served that is thrown away. After one meeting they decide to try collecting data on foods thrown away during lunch the following day to find out what problems might arise. During this trial session, they discover that they cannot count waste on each student's tray because sometimes too many children return their trays at once. They also find that they have different opinions about whether or not a serving should be counted as wasted; some children have counted only uneaten portions as wasted, while others have counted a serving as wasted if any of it were left on the plate.

After much discussion the children decide to count food as wasted when it appears that at least half of the portion is uneaten. They also decide to record waste only for every fifth person bringing a tray to the disposal area. Each child in the group is to count one of the items on the menu.

The teacher, who is visiting the group, asks them how they plan to compare items on the menu from one day to the next. The children decide that they need to categorize the items. They discuss the main categories of food that are usually served at a meal, such as meat and vegetables, and decide to make these five categories:

1. Meat and fish
2. Vegetable
3. Bread or roll
4. Dessert
5. Milk

The group is dissatisfied with this list because there are sometimes other items on the menu, such as casseroles, potatoes, rice, or spaghetti, that do not belong to any of these categories. During a class discussion the children explain their problem, and the girl who knows about nutrition suggests that they add a sixth category for starches other than breads and rolls that would include potatoes, rice, and noodles of all kinds. She also suggests that casseroles containing meat and noodles or rice be counted in both the meat and the starch categories, and the group agrees to carry out this suggestion. They also decide during the class discussion to collect waste data every day for two weeks.

When a final data-collecting procedure has been worked

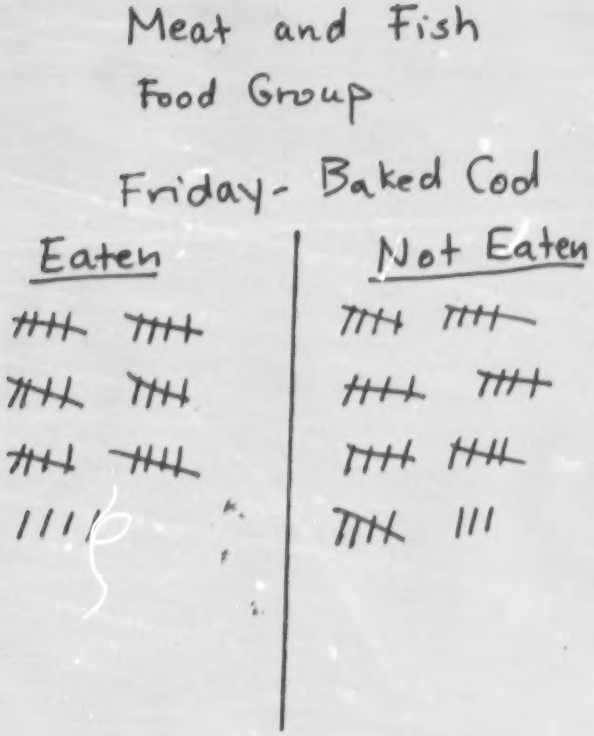


Figure B5-1

out, the six students recording food waste gather around the section of the cafeteria where trays are returned. They count students as they return their trays; when every fifth student approaches, each data collector observes his or her tray and notes how much of a particular food item is left. The milk recorder usually asks whether or not the student has drunk the milk in the carton. After carefully scrutinizing the tray for the relevant food, each recorder makes a tally mark either in the eaten or not eaten column. One student's data sheet is shown in Figure B5-1.

> *A group of children in a fourth-grade class in Eaton Rapids, Michigan, were concerned about the amount of food that was wasted in the cafeteria. They tried having two children stationed near the waste table to count items that students threw away but decided that keeping track of waste in this way was too difficult. The group then stationed a different person to observe and record leftovers for each item served. The group collected data during twenty-five minutes of each lunch period for a total of seven days. The observers counted a food item as wasted only when they were sure none of it had been eaten. (See log by Mary Szlachetka.)*

Some problems arise during the course of the groups' data collection. In some cases, the children still have a difficult time judging whether an item should be marked as "not eaten" or "eaten" when about half of it is gone. After talking over this problem, they decide that nothing can be done to improve their method of inspection. They agree to be as fair as possible when making judgments about food portions. The data collectors also have trouble finding time to eat lunch themselves because they are collecting data during the entire lunch period. As there are ten students in the group, they decide to take turns as often as possible so that everyone will have a chance to eat.

When the group has finished collecting data, the children want to report their findings to the rest of the class. The teacher asks them how they can make their data easier to understand, and the children decide to make bar graphs of their information. The data from each food group is consolidated and made into a bar graph showing number of portions thrown away each day.

When the children have completed their graphs, they show them to the other children during a class discussion. One child in another group remarks that he expected the number of portions thrown away for certain foods to be much higher, especially casseroles. A child in the Waste Group then explains that on some days they have counted fewer students eating hot lunches, probably because people had read the menu and decided to bring their lunch instead. The first student points out that the graph does not show how many people have been served each day. The teacher asks the class if there is a way to show on a graph the number of portions thrown out compared with the number served.

"We can use the ratio," one girl offers.

Other children agree that finding the ratio of number of portions thrown away to the total servings counted would make it easier to compare the different foods that are served. The teacher asks how ratios can be shown on graphs. When the children consider that using ratios may lead to graphing rather complex fractions, their enthusiasm dims until one student remembers that they can divide the denominator of the fraction into the numerator and multiply by 100 to obtain a percentage. Everyone agrees that percentages are much easier to show on graphs.

During the rest of the session, the class practices the math skill of finding percentages by helping the Waste Group with calculations. Each child takes a daily tally sheet and adds the number of portions eaten to the count of the number thrown away; then this number (total servings counted) is divided into the number of servings thrown away and multiplied by 100 to obtain the percentage of servings thrown away. The children then check each other's answers.

The members of the Waste Group complete the calculations of percentages as a group and then redraw their graphs to show percentages of foods thrown out for different kinds of vegetables, meats and fish, breads and rolls, starches, and desserts. They also make a graph for milk wastage over the ten days.

The class examines the graphs that the Waste Group has completed. The children agree that milk wastage seems to be low over the whole period. Breads and rolls are also generally eaten, although this varies more from day to day. Most desserts are not thrown away. Starchy foods such as rice are sometimes quite popular, but not when they are combined with meats in a casserole. Meat portions are thrown out often on some days but are universally eaten on others, such as when hamburgers are served; fish in any form is not very popular.

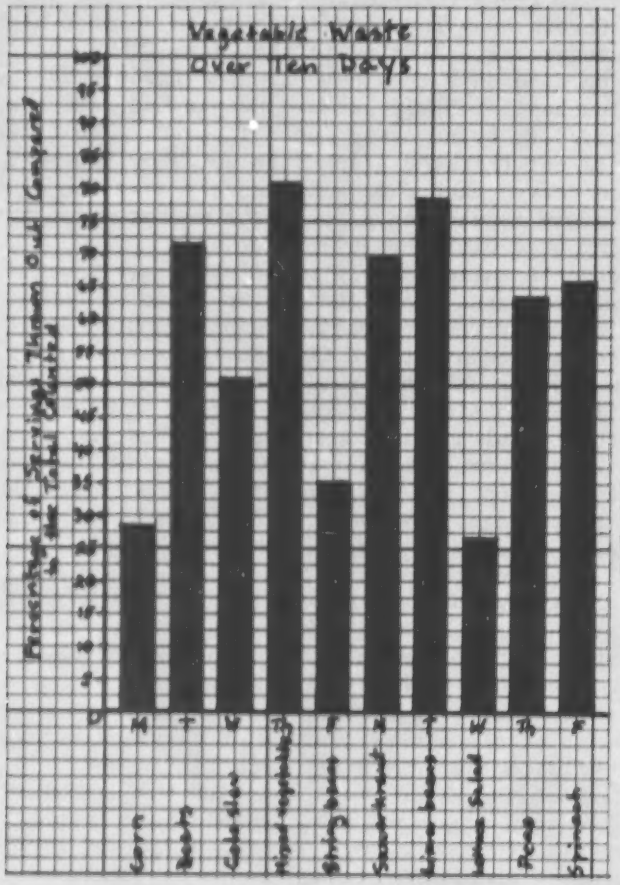


Figure B5-2

The children find that of all the food groups, vegetables seem to have the most wastage. Below is their chart of vegetable wastage over the ten day period, and the bar graph is shown in Figure B5-2.

Table of Values

Vegetable	Per Cent Thrown Away
Corn	28%
Beets	72%
Cole Slaw	51%
Mixed Vegetables	81%
String Beans	35%
Sauerkraut	69%
Lima Beans	78%
Salad	27%
Peas	63%
Spinach	66%

Of all the vegetables, only lettuce salads, corn, and string beans seem to be eaten by most children in the school; beets, mixed vegetables, and lima beans are thrown away most frequently.

The children in the group keeping track of food wasted in the Eaton Rapids class decided to graph the results of their observations. They made bar graphs of their foods according to categories--e.g., main dish, dessert, vegetable. According to the groups' findings, vegetables were the most unpopular food items. When they presented their data to the rest of the class, the children decided to recommend that only popular foods be served and that at least two different items in each category be offered during a meal. (See log by Mary Szlachetka.)

In the fifth-grade class in Monterey, children in the group timing students going through the lunch line decided to station one person to count numbers of students who forgot to pick up their silverware and two students to time children going through the line. The timers worked in pairs: one student handled the stopwatch while another recorded

the times. Each day they timed between five and twelve students from each lunch period. From this data they figured average lengths of time for primary graders and for upper graders. Timings and averages were listed on a chart. The children in the groups also made a bar graph showing the number of students in each lunch period who forgot their silverware. (From log by Pamela Fazzini.)

Meanwhile, the group organized to conduct a food preference survey works on writing the survey and administering it to students in other classes. The first question they consider is who to survey. They decide that everyone in the school should be represented on the survey because, as one student explains, "Little kids like different kinds of foods than bigger kids." At first they plan to survey everyone in the school who eats in the cafeteria, but during a class discussion several students point out that it is too difficult to give a survey during lunchtime. One child in the group then suggests that they go around to the different classes and give the survey. The rest of the class agrees but urges the group not to survey everyone in the school because of the amount of time involved. The children agree to survey only one class at each grade level from first to sixth grade. (There are three or four classes at each grade level.)

Next, the children in the Survey Group discuss the questions they want to ask in the opinion survey. They decide that they will need to find out how often each student eats in the cafeteria and to elimdnate those that don't eat very often. The rest of the questions they choose relate to the quality of the food and food preferences.

Because most of the children have never made up a survey before they write only open-ended questions, such as: "How do you like the food in the cafeteria?" and "What kinds of foods don't you like?" When they read their survey to the rest of the class, some of the children criticize the wording of the questions, complaining that the meanings are unclear and that they would take too long to answer. One girl suggests that they write questions that have choices for answers so that they will be easier to analyze. She recommends that they list specific foods served in the cafeteria and ask people whether they like them or don't like them rather than simply asking everyone to name foods they don't like. Everyone agrees that the answers will be much more

helpful if the Survey Group follows this suggestion. Otherwise, as one student points out, everyone would name different foods and they wouldn't really know which were the most unpopular.

A group of children in the Eaton Rapids class wanted to find out why servers in the cafeteria lunch line seemed so careless in their work. They spent a long time developing an attitude survey that would not be offensive to the servers but would find out how they felt about their work. They tried to make their questions relevant and clear without implying criticism or sarcasm. They also promised that the answers would be kept secret and that no one would get in trouble for the opinions they expressed. (See log by Mary Szlachetka.)

The Survey Group rewrites the opinion survey with the help of the suggestions from other children. They decide to include multiple-choice questions and two open-ended questions. They list foods that are served in the cafeteria and make three columns for children to check--"like," "don't like," and "no opinion." Since the list is long, the children eliminate foods like milk, bread, or rolls that are served everyday. They also eliminate foods that are served very seldom (such as cauliflower). Even so, their list grows very long and they still have many items unlisted.

At first they try to list different kinds of soups or sandwiches or different flavors of desserts separately; but they find that they do not have enough room on their survey for all the different foods. They then decide simply to write "soup," "pudding," etc., and to limit sandwiches to tuna, ham, and peanut butter and jelly, the three that are served most often. (A copy of the completed survey is shown on the next page.)

When a child has carefully written the survey on two sheets of ditto paper, the children in the group run off 160 copies on the ditto machine. (They figure that there are about 150 students in the six classes to be surveyed, and they make ten extra in case any are lost.)

Children in a fourth-, fifth-, and sixth-grade class in Burnsville, Minnesota, decided to improve the

SURVEY

1. About how many days a week do you eat hot lunch? Circle one of these numbers:

   0 1 2 3 4 5

2. What do you think about the foods we eat for hot lunches? Mark only one answer for each food.

	Like	Don't Like	No Opinion
Ravioli			
Meatloaf			
Hamburgers			
Hot dogs			
Salisbury steak			
Spaghetti			
Chicken			
Fish			
Tuna casserole			
Tuna sandwiches			
Ham sandwiches			
Peanut butter and jelly sandwiches			
Macaroni and cheese			
Chili			
Sloppy Joes			
Chicken chow mein			
Soup			
Corn			
Beets			
Mixed vegetables			
Baked beans			
Peas			
Lima beans			
Salad			
Coleslaw			
Sauerkraut			
Cooked carrots			
String beans			
French fries			
Potatoes (boiled)			

SURVEY (cont.)

	Like	Don't Like	No Opinion
Mashed potatoes			
Jello			
Pudding			
Tapioca			
Cake			
Ice Cream			
Applesauce			
Canned fruit			

3. What are three foods you like to eat for hot lunch but don't get? List three in spaces.

   _____ _____ _____

4. What don't you like about eating cafeteria food?

   _____

   _____

appearance of their school lunchroom by painting a mural on the wall. To find out which design most of the children in the school preferred, the children wrote a simple preference survey listing eight choices and a ninth for "other." They handed the questionnaires to everyone in the school during homeroom period. When they had tallied preferences from the completed survey, the children found that cartoon figures had received the highest vote. They began sketching various cartoon figures in preparation for painting them on the walls. (From log by Sandra Aken.)

While the children in the Waste Group are completing their data collection, the Survey Group begins handing out questionnaires. Each group member approaches one of the teachers of the chosen classes and asks permission to give the survey. When he or she has decided on a time that is agreeable with the teacher, the child returns with enough questionnaires for every student in the class. While the children answer the questions, the child giving the survey remains in the room to explain the questions when necessary.

When they later discuss the experience of giving the surveys, the children in the Survey Group agree that they have been asked many questions about the survey and that some are very difficult to answer. For example, many students complain that they like cherry jello but not lime, chocolate pudding but not butterscotch, etc. Most of the group members have asked them to explain their choices on the back; a few have suggested that they leave these blank or write "no opinion" when they can't give a definite "yes" or "no" answer. The children agree that the items on the survey like jello and pudding have caused confusion and that if they could do the survey again, they would add another question about flavors liked.

The Survey Group spends several days discussing the survey results and figuring how to analyze them. First, they decide to eliminate the children who have indicated in Question 1 that they eat in the cafeteria fewer than two times per week.

For Question 2, the children plan to count the number of students who have marked that they like a particular food. However, someone points out during a class discussion that students may not have marked any of the columns for certain vegetables; therefore the total number of students responding would not necessarily be the same for each food. The

children in the group argue that they have included the "no opinion" column for students who neither like nor dislike a particular food, but they agree that a few students have skipped some foods on the list anyway. The class suggests that they find percentages of students that like various foods.

"Besides," someone adds, "then we will be able to see right away if more people like a food than don't like it. If more than 50% like it, we might recommend that they keep serving it."

The children in the Survey Group, who hoped to avoid figuring the long list of percentages, return rather grudgingly to their calculations. They find the total numbers of students responding for each food, divide this number into the number who liked the food, and multiply by 100 to arrive at a percentage. These calculations are time consuming and the children ask the teacher for help from other students.

When all the percentages have been figured, the children make a large bar graph showing percentages of students liking each food. This graph is shown in Figure B5-3.

When the rest of the children view the graph of the Survey Group, they pick out the most popular and most unpopular foods. Hamburgers, hot dogs, corn, ice cream, and cake seem to be most popular. The least popular foods include chili, beets, mixed vegetables, lima beans, and tapioca.

When the Lansing class was given custody of the school breakfast program, the children wanted to find out which foods were most popular so that they could be served more often than others. First, they stopped ordering tomato and tangerine juices because they noticed that most children would not drink them and complained about them. Then they served each of the five remaining juices on successive days of the week and counted the number of children who took juice each day. They discovered that orange, apple, and pineapple juices were taken most frequently. Later, the children handed out written preference surveys on the types of juice and found apple to be most popular. They recommended that orange, pineapple, and apple juices be ordered and that more apple juice should be ordered than the other two. The children also handed out written surveys on pop tarts. (See log by Kathryn McNenly.)

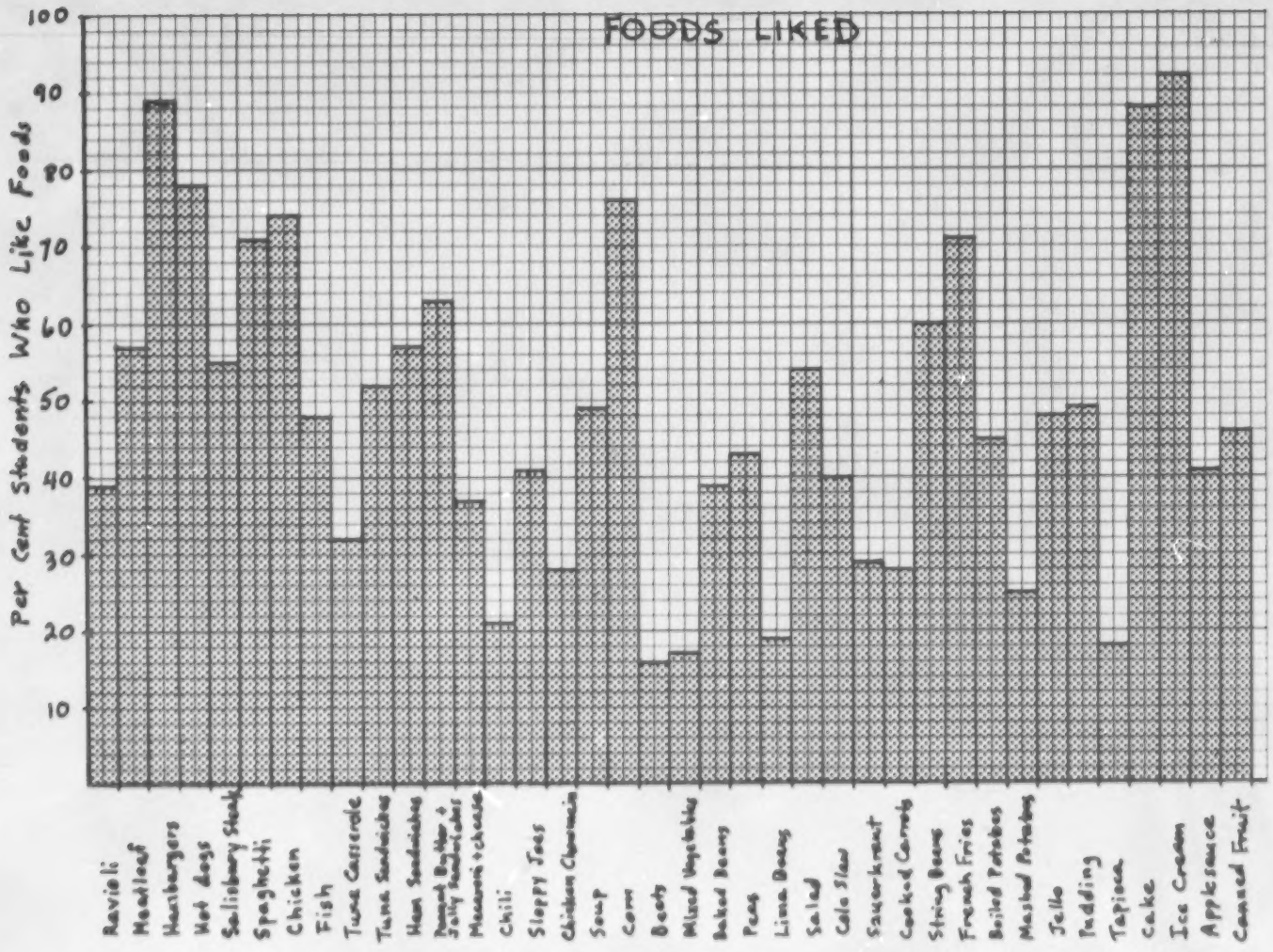


Figure B5-3

The children in a kindergarten class in Arlington, Massachusetts, decided to make a snack to eat during their snack period. They voted on whether or not to make spaghetti by placing plastic cubes together to make two towers, one for "yes" and one for "no." When each person had voted by placing a cube on one of the towers, they turned them on their side and drew around them to make a bar graph. Since not everyone had voted in favor of spaghetti, the children tried the same procedure for popcorn and found

that the class unanimously favored this food. They made popcorn in class and developed a recipe for other children to follow. (See log by Michael McCabe.)

The children spend a long time discussing how to analyze the two open-ended questions on the survey. They finally decide to work in pairs on each question. One person reads the answer and the other writes the food or idea suggested and keeps a tally of the number of children who suggest it.

While the other two groups collect and analyze data, the Research Group gets in touch with school and government officials and consults books for information on nutrition and food requirements. The first person whom they interview is the principal. She informs them of the roles of various people involved with the school lunch program. She tells them that the school nutritional expert supervises the preparation of hot lunch in the cafeteria. This person (Ms. Jones) is also responsible for making up the menus although she must follow various State and Federal guidelines. The cafeteria supervisor sends the menus to the Food Services Director for the school system, who is responsible for ordering the food, handling the money, etc.

The children in the group decide to find out more about the process of making up menus. They invite Ms. Jones to speak to the class and to answer their questions. Before her visit, the Research Group brainstorms questions that they feel need to be answered about the hot lunch program.

When Ms. Jones speaks to the class, she tells them first about government requirements for the hot lunch program. The Federal government, she says, sets a basic minimum standard for all school cafeterias to follow; individual states then add their own requirements to the Federal ones.

"The U.S. Government requires that we serve at least two ounces of protein in every lunch--that means meat, fish, cheese, or other dairy products--and three-quarters cup of fruit and/or vegetables. A roll or a slice of bread must also be served with every meal, as well as eight ounces of milk.

"The U.S. Government encourages but does not require us to serve foods containing Vitamin C (such as citrus fruits, tomatoes, and cabbage) every day and to serve Vitamin A foods (like carrots) at least twice a week."

"On top of Federal regulations, there are state requirements. Our state forbids candy or carbonated beverages to be served with a school lunch."

In a sixth-grade class in Athens, Georgia, the children decided to invite the lunchroom supervisor to speak to them about problems in the lunchroom. Before she came to the class, the children made a list of the questions they wanted answered. During her visit, she explained health rules in the cafeteria and listed state requirements for a Type A lunch. She told them that the guidelines were based on daily vitamin and mineral requirements for children of elementary school age. Then she answered the children's questions about the way various foods were served. She explained the difficulty of serving food to large numbers of people and defended her staff against many of the children's criticisms. The children felt that this interview had been helpful and had eliminated the need to work on some of the problems they had listed. (From log by Robin Sirmons.)

The children also learn that all elementary level schools are required by the U.S. Government to serve children everything on the menu. They are greatly disappointed by this rule. The dietician agrees that it restricts the changes that they can make in the menus, but she urges them to continue to find out which foods are most popular. She tells them that she tries to serve foods that are liked by everyone, even though that is very difficult. She also points out that many of the foods are bought from government surplus supplies or are made available through special government programs. These foods are considerably cheaper than items that are purchased through the market. The school budget relies on these inexpensive supplies and could not afford to pay much more for other kinds of food (such as fresh vegetables, expensive roasts, etc.).

The children ask many questions about the preparation of the food. After this interchange most children agree that the cafeteria cooks seem to be doing their best to prepare food for large numbers of people. The problem seems to be the food that is bought--canned vetetables instead of frozen or fresh ones, canned soup, chow mein, etc. Ms. Jones tells them that they will have to take these complaints to the Food Services Director. She suggests that they talk to an official in the state government to find out more about regulations and how they might be changed. She also indicates that she would like to see the results of their research.

The children in the Research Group arrange for an interview with the Food Services Director for the school system.

They also telephone the state Department of Education and speak with the director in charge of school lunch programs. Through these officials they learn more about the finances of the lunch program and the kind of foods that are bought through the government or from private companies. They also learn about nutrition and health. They ask the lunch programs director to send them booklets on nutrition printed by the state for teachers and students so they can make sure that the foods they plan to recommend are healthful.

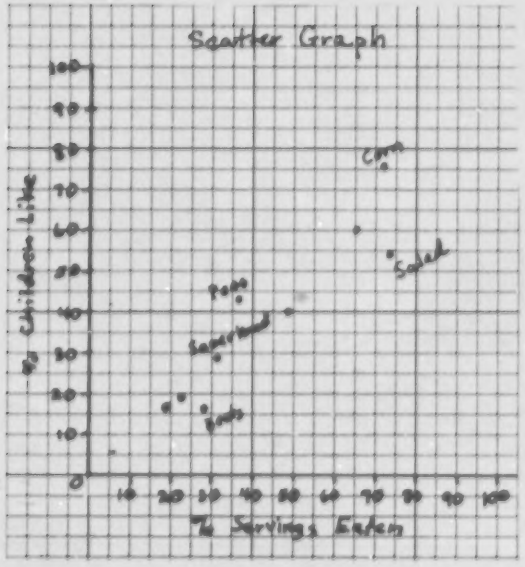
The children running the school breakfast program in Lansing gradually became responsible for taking inventory, ordering food, and even handling monetary transactions. However, they were disappointed because they could not improve the nutritional value of the breakfasts; the Public Health nurse told them that government food orders for the breakfast program were based solely on a minimum number of calories, not on nutritional content or vitamins. Thus the government bought highly sugared cereals. The children were also disappointed because they were told that the school system could not handle hot breakfasts, so that only cold cereals were offered, even during the winter months. (See log by Kathryn McNenly.)

Children in a sixth-grade class in Arlington, Massachusetts, planned to improve the quality of the food served in their cafeteria. They invited the district lunchroom supervisor to speak to the class about the nutritional value of school lunches, and a group of children worked on library research on nutrition. From the information they obtained the children calculated the caloric content of hot lunches on the menu and found that some lunches seemed to offer fewer calories than one-third of the recommended daily minimum for children of their age group. (From log by Art Shaw.)

When the Food Waste Group, the Survey Group, and the Research Group have finished collecting and analyzing their information, the class meets again to compare the findings of the three groups. First, the children compare the data

collected by the Food Waste Group with the food preference data from Question 2 on the survey. The class agrees that foods rated as unpopular are usually thrown away, for example, chili, mixed vegetables, and tapioca. Some children feel, however, that the relationship between popularity and waste is not always clear cut. Salad, for instance, has received a medium popularity rating but most children eat it. This is also true for several of the main dishes, such as Salisbury steak.

The teacher directs the class to the "How To" Cards on making a scatter graph so that they can use this method of comparing the waste data with the preference data. When the children have read the "How To" Cards, they make scatter graphs comparing the percentage of students liking each food item with the percentage of students who have eaten the item. Before they make their graphs, they divide the preference data into food categories (meat and fish, starch, vegetable, etc.) so that they can make a graph for each category. Since they have calculated percentage of food thrown away, they must subtract these numbers from 100 to find the percentage of food eaten for each item. Only foods which are included in both groups' data are plotted on the scatter graphs. Below is shown the table of percentages for the vegetable food group. The scatter graph for vegetables (comparing vegetables eaten with vegetables liked) is shown in Figure B5-4.



95 *Figure B5-4*

	% Servings Eaten	% Children Like
Corn	72	76
Beets	28	16
Cole Slaw	49	40
String beans	65	60
Sauerkraut	31	29
Lima beans	22	19
Salad	73	54
Peas	37	43
Mixed vegetables	19	17

When the children have completed their scatter graphs, they discuss them as a class. They agree that most of the foods that are popular on the preference survey are generally eaten and not thrown away; most of the foods that are unpopular are thrown away.

Many of the children in the class are surprised to find

that for a few food items, students who have indicated in the preference survey that they don't like a food seem to "gobble it down" anyway, leaving empty plates. One child suggests that a lot of students give their food away. Another feels that children are too hungry to notice what they eat at lunch. The children agree that both explanations are probably true, especially for main dishes such as Salisbury steak and macaroni and cheese. The children who have made the scatter graph for vegetables feel that many children who believe that they don't like salad must have actually picked enough raw vegetables out of their salad portions to be marked as having eaten the salad; at any rate, salad is the least wasted vegetable.

The children feel that the scatter graphs can help them choose the most generally unpopular and "uneaten" foods so that they can ask the cafeteria not to serve them. They decide that these foods include "casserole type" dishes like chow mein, chili, and tuna casserole, vegetables such as beets, lima beans, and mixed vegetables, and tapioca.

Two groups of children in the Eaton Rapids class independently arrived at the same conclusion about a food problem in the school. The children investigating food waste decided that the large amount of wastage was caused by the policy of requiring each food item to be served to students whether they wanted it or not. The group investigating attitudes of servers found out that the conflict between the desire to please students and the rule that all foods had to be served led to frustration on the part of the servers. The two groups planned to work together to find out if the rule could be changed. In the meantime, members of the Waste Group began taking a preference survey of children in the school to find out which vegetables students would eat. (See log by Mary Szlachetka.)

Deciding which foods to recommend proves to be more difficult than choosing the ones to eliminate. The class discusses the new foods that have been requested by students in Question 3 of the opinion survey. Members of the Research Group complain that their cost studies show that some of these items are too expensive to serve. The teacher suggests that children in the Survey Group meet with the

Research Group to discuss which foods to eliminate from the list of suggestions. He reminds them to consider nutritional value of foods as well as costs when deciding which new foods to recommend.

When the two groups have met, they report to the class that they have eliminated steak, roast beef, pork chops, and some fresh vegetables on the basis of cost. They have also eliminated candy and soda pop due to state nutritional regulations.

The children in the Survey Group have also listed suggestions for other improvements in the food based on the last question on their preference survey, "What don't you like about eating cafeteria food?" Many children have requested that the food be prepared better or differently. One frequent comment is that the spaghetti should have less noodles and more sauce and meat. Another complaint that occurs often is the lack of food choice given the children.

The Survey Group decides to prepare another questionnaire based on ideas from answers to the open-ended questions in the previous questionnaire. This time, they ask students to specify whether or not they will eat foods suggested by other children and approved by the Research Group, for example, pizza, turkey, and different kinds of fresh vegetables. They also ask the children given the survey to choose the most serious cafeteria problem from these four choices--

a. Poor preparation of foods
b. Not enough choices offered
c. Not enough to eat
d. Overcooked vegetables

The children choose different classes from each grade level to answer their second questionnaire. When the surveys have been completed, they are analyzed and bar graphs are made of the results. On the basis of this survey the children decide to recommend that the cafeteria serve turkey and pizza regularly and to offer more choice on the menu.

The class meets to discuss how to present their recommendations to the cafeteria supervisor. The children decide to write a letter to Ms. Jones stating their findings and listing things that they want changed. Two children volunteer to draft the letter. Before they begin this task, the class spends a session choosing their final recommendations. This is their list:

1. Serve fewer "casserole" type dishes like chow mein, chili, and tuna casserole. Eliminate beets, lima beans, mixed vegetables, and tapioca.
2. Serve corn, beans, and salad more often.
3. Serve pizza and turkey.
4. Give two choices more often. Give a choice of vegetables and salad dressing. Have soups and sandwiches so kids can eat them instead of hot lunch.

The two children working on the letter to Ms. Jones make a draft that includes this list of recommendations. They read their letter to the class, discuss changes to be made, and give the approved version to a student who is good at penmanship. He writes the letter carefully, and the whole class examines the finished version before it is sent to the cafeteria supervisor.

In a fourth- and fifth-grade class in Plainfield, New Jersey, the children decided that the most critical Eating in School problem was the absence of a hot lunch program. They decided to start an advertising campaign to get hot lunches in the schools. They formed groups to make posters and put on shows for the rest of the school. The children also wrote letters to the local Board of Education challenging the members to come to the school and taste the sandwiches that were served daily instead of hot lunches. (From log by Barbara Briggs.)

Ms. Jones informs the children that she wishes to meet with them to discuss their recommendations. When they make an appointment with her, the children also invite the principal, Mr. Hatcher, to come. During the meeting, Ms. Jones tells them that she feels their ideas are very sensible and not at all extravagant. She says she feels that Suggestion #4--to offer more choice--is the best one and that she has discussed this idea with Mr. Wagner, the Food Services Director. Instead of eliminating casseroles, as they are an inexpensive way of preparing food, they plan to offer soup and sandwiches as an alternative lunch whenever less popular meals are served. She adds that they will also try to offer a choice of vegetables. She suggests that the

children observe how much food is wasted when a choice is offered to see if people eat more of their lunch than previously.

Before Ms. Jones' visit, the class has agreed to ask her if they can try out their suggestions over a short time period. One girl who has offered to speak for the rest of the class tells Ms. Jones their idea, adding that the class will collect food waste data during this trial period.

Ms. Jones replies that as far as she is concerned, a trial period would be fine but that she would have to check with Mr. Wagner. She warns them that menus are made up well in advance so that food can be ordered ahead of time; thus they would have to wait about two months before they could try their suggestions. The children are impatient at the delay but agree that nothing can be done about it.

By the end of that week the children receive word from Ms. Jones that their two-week trial period has been approved and will take place at the beginning of March. (It is now January.) She tells them that she has arranged to have a choice of vegetables offered each day and a choice of soup and sandwiches offered whenever a casserole-type food is served.

While they are waiting to try out their changes, the children work on other aspects of Eating in School. They paint a mural on the cafeteria wall (after conducting an opinion survey to find out which design students prefer) and post a list of rules in the cafeteria in the hopes of improving lunch time behavior.

During the beginning of March, the cafeteria begins offering choices in the menu. Soup and sandwiches are offered as an alternative to casseroles when they are served and two vegetables are offered at each lunch. The children, who have received the menus beforehand for the two-week trial period, choose volunteers to tally food wasted and food eaten for the three food categories that are affected by this change--the meat and fish, starch, and vegetable categories. They use the same method as the children collecting data before the changes (each person observing one type of food).

After the two-week period the children add up their results for each food item and calculate percentage of food waste as they have done the first time. They also make bar graphs showing percentage of food wasted for the various items served in each food category. The children also want to make graphs comparing percentage of food wasted before a choice is offered with percentage of food wasted after a

choice is offered. However, they cannot figure out how to make a bar graph or a line chart that will show a good comparison between the two sets of data. At the teacher's suggestion, they decide to order their percentages for each food category for the "before" set of data and for the "after" set of data and to make a chart showing the two sets. This will make it easy to examine the data, they agree. They also decide to calculate and compare the average percentage wasted for each food category in the "before" and "after" sets. The chart that they make for the vegetable food group is shown below.

Chart for Vegetable Food Group

"Before" choice		"After" choice	
Salad	27%	Corn/String beans	11%
Corn	28%	Salad/String beans	13%
String beans	35%	Corn/Peas	21%
Cole Slaw	51%	Salad/Broccoli	31%
Peas	63%	Corn/Mixed vegetables	35%
Spinach	66%	Spinach/Peas	55%
Sauerkraut	69%	Baked beans/Sauerkraut	56%
Beets	72%	Beets/Lima beans	63%
Lima beans	78%	Carrots/Mixed vegetables	66%
Mixed vegetables	81%	Beets/Squash	71%
Average waste	56%	Average waste	42%

After examining the charts the children agree that offering some choice at lunch has made a great difference in the amount of food waste. They note that the average waste (rounded off to the nearest 1%) has decreased by 14% for vegetables, 7% for meat and fish, and 6% for starch. They feel that vegetable wastage could have been decreased even more if Ms. Jones had not served as second choices several new vegetables that turned out to be unpopular. They advise her to stick to the vegetables that have already been proved acceptable to most students. The children also recommend that the more popular vegetables be served with vegetables of medium popularity to cut down even further on food wastage.

Ms. Jones notifies the class that she will try to take their findings and recommendations into account when she makes up the menus for the rest of the year. She also promises to serve pizza and turkey at least once before the end

of the year. If this system continues to create less food waste, it will also be continued in the future.

The children are proud of their success at improving the hot lunch program and continue to work on other lunchroom problems over the next few months.

Children in the Monterey class presented the principal with a list of recommendations for improving the flow of traffic in the lunchroom and the accuracy of the lunch counts. The children were given permission to try out their program during the last two weeks of school. Although several problems arose during the trial period, the class was able to solve them successfully. They also collected data for five days to compare with the data they had collected before the changes. When they had graphed their results, they were pleased to discover that their graphs showed average times in the lunch lines to be much lower and the morning lunch counts to be much closer to the actual numbers sold. Also, fewer children forgot to pick up their silverware. The children interviewed other people in the school and found that most people supported the program and wanted it continued during the following year. (From log by Pamela Fazzini.)

6. QUESTIONS TO STIMULATE FURTHER INVESTIGATION AND ANALYSIS

- What are some of the things you like about eating in school?
- How can you find out whether most students think there are problems?
- How could you find other evidence to prove there are problems?
- Which problems seem to be most critical?
- How long do students have to wait in the lunch line? What seems to make the wait so long? How can you measure the flow of traffic in the lunchroom? How can you rearrange the furniture to make the lunch line move faster? How can you improve the order of the items in the serving line?

- What is wrong with the present lunchroom environment? How does noise, the appearance of the lunchroom, student behavior, etc., affect your eating enjoyment? How could you measure sound levels in the lunchroom? How could you find out what new furniture arrangements, decor, rules, etc., students would prefer? How could you find materials for improving the lunchroom (paint, soundproofing, etc.)?

- How could you tell whether or not students like the food that is served? How can you tell what kind of food they would prefer? How can you find out what regulations there are about foods that are served? How can you find out nutritional requirements that should be met?

- What data do you need to collect?

- How can you best organize yourselves to collect the data you need?

- What is a good way of making a picture of your data?

- What does your data tell you?

- What recommendations could you make based on your data? To whom could you make these recommendations?

- How could your recommendations be tried out?

- How could you find out whether or not your improvements have made a difference?

- What could you do about other problems related to lunch, breakfast, or snack time?

C. Documentation

1. LOG ON EATING IN SCHOOL

by Michael McCabe*
Locke School, Kindergarten
Arlington, Massachusetts
(November 1975-February 1976)

ABSTRACT

This kindergarten class worked on Eating in School over a period of a few months. The children's challenge was to make a snack for snack period. In selecting the type of snack, they used plastic blocks stacked together to make three-dimensional bar graphs of different choices. First, they surveyed preferences for hot or cold snacks. When they found hot snacks to be preferred, they took surveys on different kinds of hot snacks and found that a few children disliked spaghetti but that everyone liked popcorn. They decided to make popcorn and worked in groups making up and writing out lists of necessary ingredients and a letter to parents requesting these items. When they received enough supplies, they developed their own recipe by weighing amounts on a scale and using metal bolts as a standard. The children successfully made, ate, and enjoyed popcorn, and their recipe was found and followed by the afternoon kindergarten class.

I introduced the Eating in School challenge to my morning kindergarten class by asking them if we could make our own snack for snack time. We discussed what type of snack to make--first of all, did we want hot or cold snacks? In order to find out which were preferred, the children suggested that we use the set of Unifix cubes (small, plastic, interlocking cubes) to make towers. (They had already learned how to do this during other activities.)

Each child took a Unifix cube, and the kids who wanted cold snacks built one tower, while the kids who wanted hot snacks built another. We compared the two towers and discussed what they showed us. A small group of children laid the towers on a large sheet of paper and traced around them. They wrote down the number of blocks in each tower and labeled each outline. The entire group had a chance to count the cubes and compare the numbers in a physical and in a pictorial way before the session ended.

*Edited by USMES staff

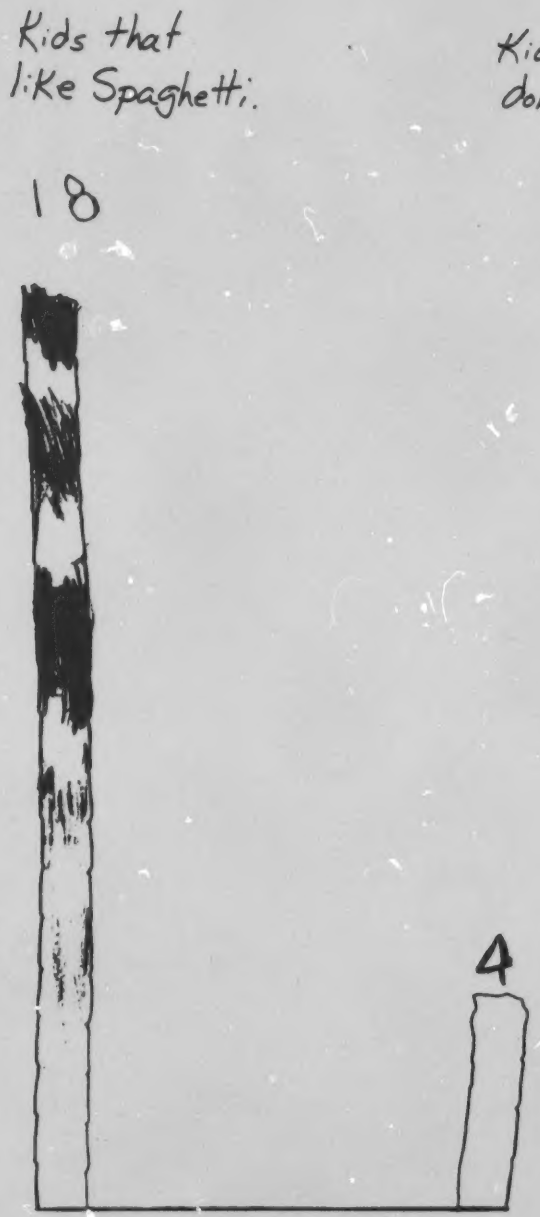


Figure C1-1

Since everyone agreed that the majority wanted a hot snack, we talked about what kind of snack we wanted during the next session. Some spaghetti lovers proposed that we make and eat spaghetti, and so we decided to take a survey to test the popularity of this food. We used the Unifix cubes again, this time to compare the number who liked spaghetti with the number who didn't. We took the survey the same way--by building towers and tracing around them. We colored in each square and labeled the outlines to complete our graphs. Then we compared the heights of the bars and counted the squares, and assigned number values to the bars. Our graph is shown in Figure C1-1.

There were a few children who didn't like spaghetti. Someone suggested that they bring their own snacks, but another's suggestion to look for a snack that *everyone* liked prevailed. Popcorn seemed to be very popular, and so we took a preference survey on popcorn and made pictures of the graphs. There weren't any blocks in the group labeled "Kids that Don't Like Popcorn." We decided to make popcorn.

During the third session, we again discussed the results of our popcorn survey and listed the ingredients for popcorn: butter, popcorn seeds, sugar (white stuff). We discussed what the "white stuff" in popcorn really was, and the children decided that it wasn't sweet, but salty, so it must be salt. Also listed were a pan, a stove or hot plate, popcorn popper, cups, plates or bowls, and napkins. A group of children worked on this list with me. One child's copy is shown in Figure C1-2.

We discussed where we might obtain the items on our lists. The kids suggested the A & P and "the other store." Someone said that we could have Mr. McCabe "send a note" home (a practice we had made in the past). Instead, a group of us composed a notice to send home to the "mothers." (At my suggestion, we substituted the word "Parents" for "Mothers" in the address.) The notice that we dittoed and sent home is shown in Figure C1-3.

Writing the lists of items for making popcorn and the letters to parents gave the children some important language and reading experience.

The notices we sent brought results, although the parents didn't read or follow instructions! Instead of receiving notes indicating what they could contribute, we received the items themselves: 1½ pounds of butter, more popcorn than we could use in a week, a quart bottle of oil, three corn poppers, and enough salt to fill the sand table.

Once we had our ingredients, we needed to figure out how much of each went into making popcorn. Some of the children

THIOS we needD
Butter
POPCORN seeDS
SSalt
PAn HotPlate
stoveOr POPCORN ~~Pan~~ Popper
PIUG

Figure C1-2

DEAR PARENTS
WEARE GOING TOMAKE
POPCORN FOPOUR SNACK
WE NEE DPOPCORN SEEDS
BUTTER SALT AND A POPCORN
POPPESR SEND A NOTE TO
SCHOOL THANK YOU
ERICA

Figure C1-3

Dear Parents,
We are going to make popcorn for our snack
We need popcorn seeds, butter, salt and a popcorn popper.
If you can help us with any of these ingredients
please send a note to school. Thank you.

remembered helping to make popcorn at home. Aided by these children and directions on the popcorn poppers, we measured the right amounts of the various ingredients.

We decided to make a recipe so that we would remember how to make popcorn and could tell others how to do it. Because the children had previously learned to measure things on a balance using metal bolts as a standard, we decided to find out how much our ingredients weighed in bolts. We put the amount of popcorn that we used in one popcorn popper in the balance pan and added bolts to the other side until the scale balanced at nineteen bolts. We did the same for other ingredients. The children wrote up the recipe (see Figure C1-4) and distributed it to everyone in the class.

After we had made popcorn in the morning class, my afternoon class found the recipe and wanted to make popcorn, too. A popcorn group was easily formed to acquire supplies. They made use of leftovers from the morning class and brought in other supplies from home. This class managed to follow the other kindergartners' directions and make popcorn with a minimum of trouble but with a great amount of discussion.

Before the school year ended, I managed to persuade the P.T.A. to buy a toaster oven for the kindergarten classes so that they could try other kinds of hot snacks. However, this arrived too late in the year for us to make other hot foods.

A RECIPE FOR POPCORN
① WASHHANDS
② 19 BOLTS OF POPCORN
③ CUP WITH OIL IT 29 BOLTS
④ 3 BOLTS OF BUTTER
ERICA

101

Figure C1-4

102

2. LOG ON EATING IN SCHOOL

by Mary Szlachetka*
Northeastern Elementary School
(Grade 4)
Eaton Rapids, Michigan
(September 1972-February 1973)

ABSTRACT

When this fourth-grade class discussed problems in the school lunchroom, the children focused on the long serving line, congestion in the lunchroom exit area, poor quality of service, and the large amount of food that students wasted. One group used a stopwatch to time how long each grade took to eat lunch. After collecting several sets of data, this group made a bar graph of the results and concluded that the line was moving about as fast as possible. Another group designed a questionnaire to try to find out why student servers in the cafeteria were careless and sloppy at their jobs. They found that the main problem seemed to be the rule that each student had to receive every food item whether he/she liked it or not. Another group concerned about the amount of food wasted in the cafeteria was also disturbed by this rule, which they felt created unnecessary waste. They collected data on the number of servings wasted per day and on the popularity of various foods. A group studying the physical layout of the lunchroom measured the area and built a scale model with movable tables and benches. They compared the present layout of the cafeteria with alternative arrangements and chose the arrangement they felt to be the best improvement.

The following year, a group of students who had worked on lunchroom problems the previous year gathered to prepare their data for presentation. They improved graphs of food wastage and survey data and prepared a scale map of a new lunchroom setup. Many of the children then continued to experiment with new lunchroom designs and followed up some of the suggestions with a lunchroom "trial period." As a result of a new arrangement, the amount of waiting time for students in the serving line was decreased. The children also instituted a system of selecting the tallest third graders to serve during the first lunch period.

During a discussion about problems around the school, I asked the children for their views on how the lunchroom was run. I wrote some of their comments on the board as they

*Edited by USMES staff

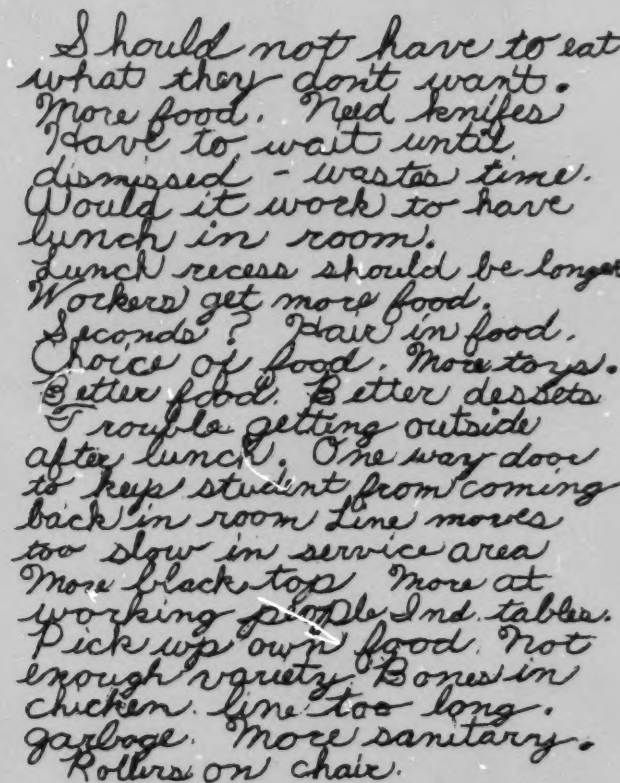

Should not have to eat
what they don't want.
More food. Need knifes
Have to wait until
dismissed - wastes time.
Would it work to have
lunch in room.
Lunch recess should be longer
Workers get more food.
Seconds? Fair in food.
Choice of food. More toys.
Better food. Better desserts
Trouble getting outside
after lunch. One way door
to keep student from coming
back in room Line moves
too slow in service area
More black top More at
working people and tables.
Pick up own food. Not
enough variety Bones in
chicken. line too long.
garbage. More sanitary.
Rollers on chair.

Figure C2-1

gave them. Their main complaints about lunch were--

1. Line moved too slowly.
2. Line was too long.
3. Exit area was too congested with people coming in and out.
4. Too much garbage.

Some students thought there should be two service areas and more serving people. Others felt that the lunchroom should be self-service or that each class should eat in its own room. One student suggested a one-way exit door.

The children also thought that they should not have to eat food they didn't want and that they should have better food, larger portions, second helpings, a more varied menu, and two meals to choose from each day. They felt, as well, that they should not have to wait to be dismissed and that they should have a longer play period after lunch, a larger play area, and more equipment. (One child's copy of the list on the board is shown in Figure C2-1.)

I suggested they observe several lunch periods to see if their list of problems was complete and accurate and to discover which problems concerned them the most. The students who volunteered discussed how they would go about this. They decided to station observers in the hall, at the ticket taker's table, at the serving area, and at the fourth-grade table in the lunchroom. They also decided to take notes on their observations.

The volunteers observed in the lunchroom for several days and then reported their findings to the rest of the class. After much discussion and some minor revisions, the children concluded that their list of problems was complete. The class decided to group the problems under various topics, such as service, food, line-ups, eating area. They seemed to grasp quickly the idea that it is necessary to keep information organized in order to do anything with it. They also realized that their list was too broad, and they chose to eliminate for the present problems associated with the playground and those problems (such as cafeteria food) that would be difficult for them to improve.

During the next session, we talked about the problems on which we had decided to work. The students were most interested in finding out how long it took classes to go through the lunch line. They decided to time children in grades one through six. A group of students volunteered to work on this problem. For several months, this was the

only Eating in School activity. Other groups gradually emerged to work on the quality of service, wastage of food, and the physical layout of the lunchroom.

The children in the Timing Group wanted to find out how long it took each grade to eat lunch. Each group member was made responsible for timing one grade level. After much discussion, the children set up the following system: The timer recorded the time the first person from the grade left his or her classroom and the time the last person left the lunchroom. During this span of time, the students in each grade walked down the hall to the lunchroom, waited in line, picked up the meal, ate, disposed of rubbish and dishes, waited to be dismissed, and filed out. The first times were taken from the clocks in the hall, the second from the clock in the lunchroom.

During their timing session, the six timers stood in the hallway and timed the first class in each grade level to leave for lunch. Some of the children asked various teachers to tell them the exact time to the nearest minute. A few received short lessons on reading a clock from the teachers. To find out which were the last classes to leave the cafeteria from each grade, the students watched sections where particular grades sat and asked the lunchroom monitors to tell them when all the students from that grade level had finished.

On the day following their timing session the timers met as a group to compare their data. They had not yet determined the difference in time from their data sheets. Below are the data they had collected:

	Time Left Classroom	Time left Lunchroom
1st grade:	11:33	11:57
2nd grade:	11:30	12:00
3rd grade:	11:39	12:03
4th grade:	11:59	12:24
5th grade:	12:06	12:23
6th grade:	12:08	12:30

At first the children wanted to use a cardboard clock to find the times, counting forward from the beginning to the ending time. Another student suggested that we subtract, although only after I had emphasized the word "difference." The times were placed on the board and students began subtracting their own times. Most of their answers were correct, but the grade three and grade four times presented

problems to the children. For example, they subtracted 11:39 from 12:03 and got 64 minutes instead of 24 minutes. They soon realized that the times with different hours (as in the above problem) did not come out right, whereas the other answers were correct. Of course, they were subtracting as if there were 100 minutes in an hour instead of 60 minutes. None of the children could figure out how to get the correct answers, and so I explained how to borrow 60 when subtracting minutes. We practiced a few problems together, and the group presented their correct times to the whole class:

1st grade:	24 minutes
2nd grade:	30 minutes
3rd grade:	24 minutes
4th grade:	25 minutes
5th grade:	17 minutes
6th grade:	22 minutes

When the children compared the data for all the grades, they were disappointed that the times were so similar. The group lost its sense of direction and its members went off to join other groups active at the time.

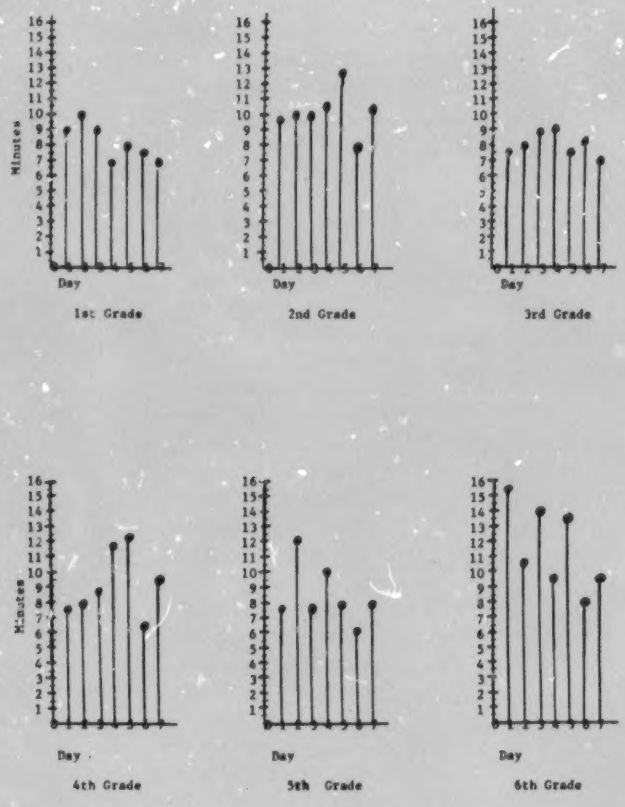
Several months later when the lunch schedule had been changed, a Timing Group again emerged to compare the length of time it took different grades to eat lunch. The children decided to use stopwatches to measure the number of minutes between the time that the first person in the grade left his or her classroom and the time that the last person sat down to eat. They also planned to take measurements for several days.

The children practiced using a stopwatch by timing each other as they walked around the room. They also referred to the "How To" Cards on using a stopwatch.

Each of the group members timed one grade for several days in succession. They were scrupulous about collecting complete data each day. When they discovered on one of the days that one timer had arrived late at his station, they threw out that day's data. They discarded timings taken on another day because one of the stopwatches malfunctioned. On another day the fifth- and sixth-grade classes were mixed together; since the timers covering those grades weren't sure their information was accurate, that day's timings were also rejected.

The group finally collected seven sets of data that the children felt were complete and accurate. They compared

the different sets and noted factors that might influence the amount of time taken. For example, they noticed that whenever a popular meal was served, more people bought hot lunches; consequently all the lunch times were longer. They organized the data and made a bar graph of time spent in the lunch line for each grade.* Copies of their six graphs are shown below:



NO. OF MINUTES IN LUNCH LINE - BY GRADE

*The children might construct graphs that would show the differences when factors such as type of meal served or grade level were taken into account. Bar graph tallies could be made of the number of times a grade took 7-8, 9-10, etc., minutes to eat. See Background Paper, *GR 3 Representing Several Sets of Data on One Graph*.--ED.

(1) Do you have to work in the lunch line?____
(2) Do you like working in the serving line?____
(3) Which job would you pick if you had a choise?

---

(4) Do you like your present job?
☐ for free lunch.
☐ don't have to go outside
☐ its fun.
☐ Makes me feel important
☐ other
(5) Which is easiest to Serve
A lunches on buns + fish ☐
B. lunches on mashed potatoes ☐
C. casseroles already mixed ☐
D soups or chile ☐
(6) Which job is best for you
A Silver ☐ B Plates ☐
C. Main dish ☐ D. Bread butter ☐
E vegetable ☐ F Desserts ☐
H. Topping or relish ☐ Milk ☐
(7) Which grade gives you the roughest Time, while you are serving them?_____
(8) Do you backFIRE on The people who give you a hard time._____

(9) Are you bothered at all by Smartalecs._____
(10) If you could ask all the kids to do Something to make your job easier, what would it be

---

Thank you.

Figure C2-2

The group concluded from their data that the lunch line was moving about as fast as possible. Each day some grades took longer than others, but they were not the same grades every day. Furthermore, the group felt that during the time they had worked on the problem, the situation had improved and that perhaps their seven sets of timings reflected the improved situation. When they reported their findings and conclusions to the class, the others agreed that there were no longer back-ups in the line as there had once been.

In January a group formed to investigate the quality of service in the school cafeteria. The children wondered why the student servers worked at their jobs since they seemed so careless in their work. Several students felt that we should interview the servers to find out. Others felt that a standardized questionnaire should be designed for them so that the responses could be compared more easily.

Five students volunteered to design a questionnaire and spent many weeks working on it. They started by writing five different questionnaires, each arguing that his was best. Gradually, however, they learned to work together. They learned how to judge whether a question was relevant and whether its meaning was clear. Before they began, the others had warned them not to ask questions that would antagonize the servers (e.g., why do you do such a sloppy job?) if they wanted to get honest responses, and so they eliminated all traces of irony and sarcasm. They also learned to recognize and eliminate questions that merely restated, with a slightly different focus, ones already chosen. The questionnaire they finally developed is shown in Figure C2-2.

The children in the group were afraid that the servers might not answer their questions honestly because they might think someone was trying to take their jobs away or get them in trouble. To set them at ease, the students decided to write an introductory statement explaining the questionnaire and promising secrecy. Because they were having trouble working on this as a group, I divided the group in half and the two subgroups developed separate paragraphs. After examining the drafts, the group settled on the following introduction:

> We have 10 questions for you to answer. Nobody else will see them except our room. Please do all of them and when you finish there will be a box on the refrigerator in the kitchen. Please take your time. Do not put your name on it. Thank you.

One student copied the questionnaire onto a dittomaster, ran it off, collated and stapled it. He checked with the lunchroom staff to find out the best time to distribute the questionnaires and then went down, passed them out to the servers, and answered their many questions. During this time the rest of the group members worked with other groups.

Within a few days all sixteen questionnaires had been returned. The group examined the responses and discussed how to record the data. The answers to questions that seemed graphable to them (#1,2,8 and 9) were recorded on simple bar graphs.* One of their graphs is shown in Figure C2-3.

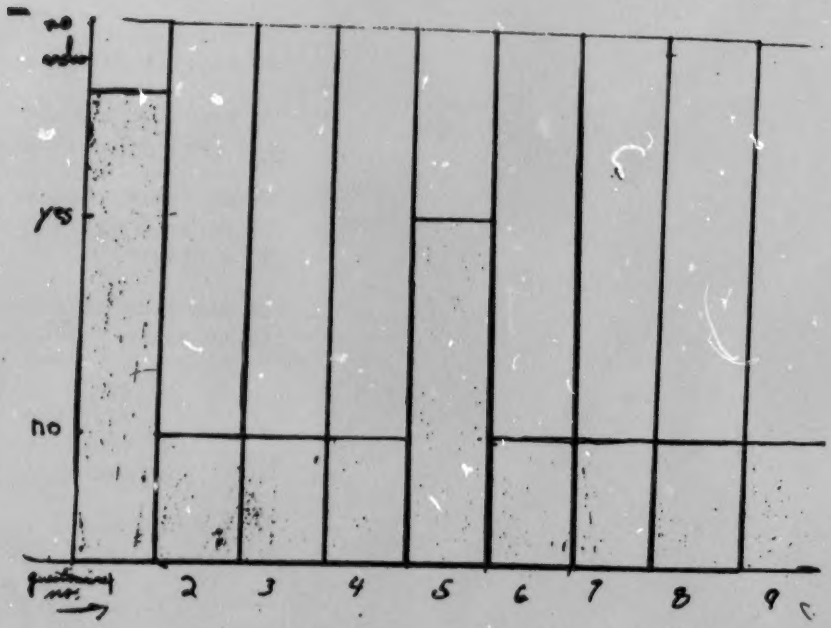


Figure C2-3

The responses to the other questions presented problems to the children who wanted to organize them. First, they started writing down all the responses from each questionnaire on a different piece of paper. After they had realized that they were only copying the raw data, another

*The children could calculate percentage of positive replies and graph these. If a change is implemented, they might compare the results with answers to questions about other chores.--ED.

student suggested writing the sixteen responses to each question on a separate sheet of paper. The group agreed that this was a better method and proceeded to assemble the answers. They felt that no other organization was necessary since they thought they could establish trends from their data sheets.

For each of the questions, the children counted the number of similar responses and drew conclusions about trends when they could. Here are the ten questions and the number of different responses they received for each.

Questionnaire

1. Do you <u>have</u> to work in the service line?
   (4 yes; 11 No; 1 no answer)

2. Do you like working in the service line?
   (14 Yes; 1 No; 1 no answer)

3. Which job would you pick if you had a choice?
   (5 serve food; 3 plates; 1 tables; 2 don't care;
   5 no answer)

4. Do you like your present job?
   (2 no answer; 1 multiple answer)
   - (3) for free lunch
   - (0) don't have to go outside for recess
   - (5) it's fun
   - (0) makes me feel important
   - (5) other _____

5. Which is easiest to serve?
   (2 no answer; 1 multiple answer)
   - (7) Lunches on buns
   - (2) Meaty sauces on mashed potatoes
   - (1) Casseroles (already mixed)
   - (3) Soups or chili [sic]
   - (0) Special dinners (Christmas, Thanksgiving, etc.)

6. Which job is best for you?
   (2 multiple answer)
   - (0) Eating utensils
   - (5) Plates
   - (3) Main dish
   - (0) Bread & Butter

(0) Relishes (ketchup, mustard, tartar sauce)
(2) Vegetables
(0) Dessert
(2) Topping
(2) Milk

7. Which grade gives you the roughest time, while you are serving them?
(5 1st; 1 2nd; 1 3rd; 2 6th; 1 4th & 5th; 1 5th & 6th; 3 4th & 5th & 6th; 2 no answer)

8. Do you "backfire" on the kids who give you a hard time?
(8 Yes; 5 No; 3 sometimes)

9. Do "smart alecs" bother you?
(10 Yes; 4 No; 1 sometimes; 1 no answer)

10. If you could ask all the kids to do something to make your job easier, what would it be?
(5 don't complain about food; 4 be polite; 5 miscellaneous; 2 no answer)

The group reported its findings to the rest of the class. They concluded that the servers did not work in the service line because they had to; they worked because they wanted to. Most servers worked either because they thought it was fun or because they received a free lunch for doing so. Opinions about the easiest and the best jobs varied considerably. About half the servers thought the lower grades were most difficult to serve and half thought the upper grades were most difficult. Most servers were bothered by troublesome students and thought their job would be easier if the students were more considerate and didn't argue when they were served food they didn't like.

During the last few weeks of school the children in this group twice worked as servers to see if they could understand the attitudes of the regular servers. On the first day they found the job easy and couldn't understand what the others had complained about. They received many compliments on their attitudes from children going through the line. On the second day, however, the supervisor stressed that they must give all food items to each child whether he or she wanted them or not. The children then experienced the frustration of not being able to please both the supervisor

and the students. This time the students also harassed the servers when they mixed food items together by mistake while serving.

During a class discussion, the group made the following recommendations:

1. Each food item should be placed in an individual dish and put on the counter for the children to pick up themselves.

2. Milk would also be picked up by the students themselves.

These recommendations would make the cafeteria into a self-service line. Flat trays would have to be acquired to replace the compartment trays presently used for serving. Unfortunately, the group did not have time to do a comparative cost analysis of the two methods before the school year ended.

In March a new group formed to examine the problem of food wastage. The children were concerned because some people threw away food they didn't like while others begged for seconds. They decided that the problem was caused by the rule that everyone served hot lunch had to take each type of food whether he or she wanted it or not. What was not eaten was simply thrown away.

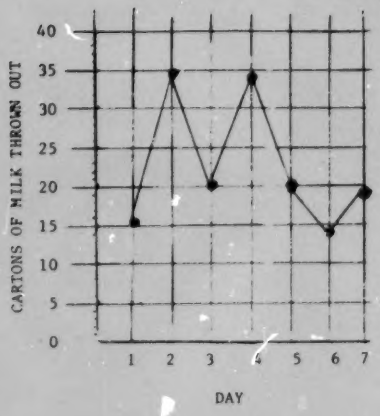
The group discussed how to gather data on the amount of food wasted. One student suggested having an observer stationed at each table, but they decided that it would be too difficult to keep track of everyone at the table. Another student suggested that each person waiting in line to dispose of food and dishes be stopped so that his or her food could be examined; the others argued that this would hold up the line too much. One student wanted a conveyor belt so that the children could put their trays on it and inspectors could view and count the food as it went by; the group decided that a conveyor belt would cost too much money. Another student suggested letting all the trays pile up and then counting the amount of wasted food after the lunch period, but the others thought that this would surely create more problems than it would solve.

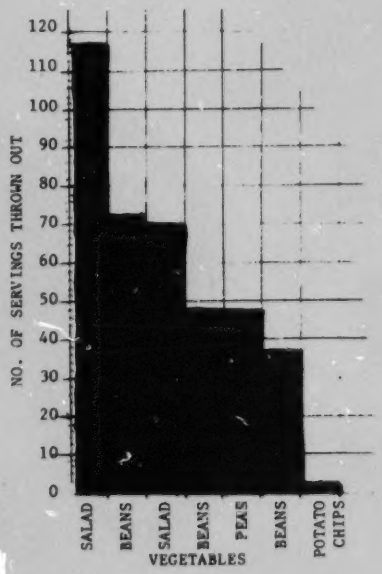
The group decided to try out another student's suggestion during one lunch period. Two students stood near the waste table and wrote down what items each student threw away. They reported to the group that it was difficult to keep track of everything this way. The group, after some discus-

sion, then decided to have a different person observe and record leftovers for each item served and to count only those items thrown away without having been eaten at all.

The group collected data during twenty-five minutes of each lunch period for a total of seven days. Each student kept a tally of how many servings of one item were thrown away untouched. If they were not sure whether some of the food had been eaten, they asked the student. However, they did not keep a count on every item for every day. For some days the dessert data was missing, for others the main dish data, and so on.

In order to make their data more understandable, the group decided to graph the results. The students planned to graph the data in many ways--according to food wasted per day, according to item, according to categories (main dish, dessert, vegetable, etc.). However, they ran out of time to do this cumbersome job. They had time only to graph food by category. A copy of their milk graph is shown below. The vegetable graph next to it shows what vegetable was served each day for seven consecutive days and how many portions of it were thrown out untouched.*





*If the lunch count (number of meals served per day) was known, the percentage of portions thrown away could be calculated and graphed.--ED.

When they presented their data to the rest of the class, the children recommended that only foods that seemed popular and were seldom thrown out be served and that at least two different items in each category be offered at each meal. These recommendations corresponded with the findings of the group investigating server attitudes; both groups felt that their problems were caused largely by the policy of giving people food they didn't want and wouldn't eat. The class discussed the fact that menus were determined by the state and might not be subject to change by cafeteria staff. They wanted to find out whether the foods were required by state law to be placed on students plates or simply to be made available. They would then know whether their recommendations were feasible. The two groups decided to work together in the fall to find out what changes could legally be made.

According to the Waste Group's data, vegetables seemed to be the most undesirable food item. Corn appeared to be the only one most everyone ate. During the last few days of school, two members of the Waste Group began a survey to find out which vegetables students liked. They went around to each classroom and asked each student to write down two vegetables he or she would eat. School ended before the students could tally all the data, but they reported that corn and fresh tomatoes were the only vegetables that almost everyone would eat. These students also decided to continue their work in the fall.

During a class discussion in the middle of the school year, we discussed the problem of waste disposal in the cafeteria. The students had noticed that the trays were piling up faster than the work crew could scrape off the garbage and stack them for washing. As a result, garbage was falling to the floor, causing students to slip on it and making a mess. When I asked the class to explain the system of disposing of used trays, no one could make himself clear. We decided to use the spare table in the room to demonstrate the disposal process. One student took over and directed us to different posts. We then tried out various changes, but none seemed satisfactory.

A student suggested that the physical arrangement of the lunchroom might be improved as a solution to the problem. The children began drawing diagrams on the board to explain their changes in the lunchroom. However, the other students argued as to the placement of certain items in the drawings of the lunchroom. Several children offered to work on maps of the lunchroom as it presently existed and as they would like to see it changed.

During the next session, we examined maps of the lunchroom made by various students. The class realized that each map showed the tables a different size in proportion to the size of the lunchroom. One student suggested that we measure the lunchroom, but another objected because "we can't make a map as big as the room!"

I showed them a map of Michigan and asked how it was made. Other students replied that "they shrunk it" and someone offered: "If the lunchroom is twelve feet long, that can be twelve inches on paper." The others agreed that this would work and began to think about how to measure the room and make a scale model.

Several children began measuring tables in the lunchroom. They had trouble deciding whether or not to measure only one of the tables because they all seemed to be the same size. However, some of the children were not convinced that this was so. Remarking that "different factories might have made them," they decided to measure all eight. Sixteen children worked in teams of two on this task. When someone discovered that they had forgotten about the ninth table, the trash table, one of the teams took the responsibility for measuring this. The children also measured the benches in the room.

The measurers spent a long time organizing and analyzing their data. First of all, everyone's measurements were in different units--all inches, feet and inches, all feet. Once the measurements had been standardized, the children found that all measurements except width of benches were different for all groups. Some groups appeared to have kept careless records. We went through each set of figures and tried to recall how they were determined. In this way most of the mistakes were found and corrected. The following are their average figures for tables and benches:

Tables	Benches
12 ft. long	12 ft. long
30 in. wide	9 1/2 in. wide

Meanwhile, other children worked on measuring the lunchroom itself. One girl brought a tape measure from home and went with three other children to measure the room. Another group of four measured it using a yardstick. After collecting several measurements, the two groups reported their figures to the rest of the class. There was a discrepancy between the length measurements of the two groups, and the

class wanted to remeasure. We chose one representative from each of the old groups plus a new person to find the "correct" measurement.* Unfortunately, the figure arrived at by this group differed by several feet from the two previous figures. In exasperation, the class decided to remeasure twice more. Two teams of three students very carefully measured the lunchroom again. They both found the length to be almost exactly sixty feet, a figure also arrived at by one of the early groups. We decided to use this as our length measurement.

The width measurements of the lunchroom were all very similar: 38 ft., 11 in.; 38 ft., 9 in.; and 38 ft., 8 in. After some discussion about which measurement to use for our scale model, the class decided to use the median width of 38 ft., 9 in.

A group of six students formed to start work on the scale model of the lunchroom. They decided to use a piece of cardboard 6 ft. by 4 ft. for the floor plan and chose the scale of 1 in.↔1 ft. Thus the floor on the model was 60 in. or 5 ft. long and 38 3/4 in. or 3 ft. 2 3/4 in. wide.

To make their model, the Map Group measured the dimensions onto the cardboard using yardsticks and rulers. They cut out tables to scale from a piece of tagboard. When they realized they had forgotten the benches, they made new tables, adding on the dimensions of the benches so that they would not have to make separate pieces. They decided to leave the tables unfastened so that they could be moved around from their original positions when it was time to work out lunchroom improvements.

Members of the Map Group went back to the lunchroom to measure the distance between tables and between the tables and the walls. The children made marks on the floor plan to indicate the present layout of tables and barrels so that they could compare it with alternative plans. Here is a sketch of the present layout including the measurements that the children used on their large floor plan:

*The children could first determine the accuracy of each tool and decide which should be used for each specific measurement. See Background Paper, *M3 Determining the Best Instrument to Use for a Certain Measurement*.--ED.

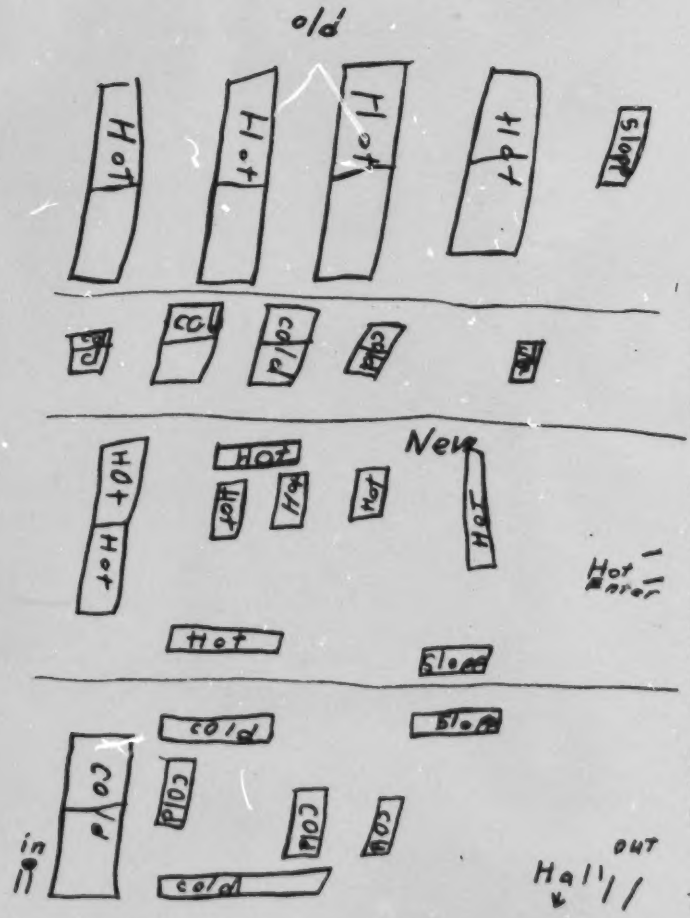
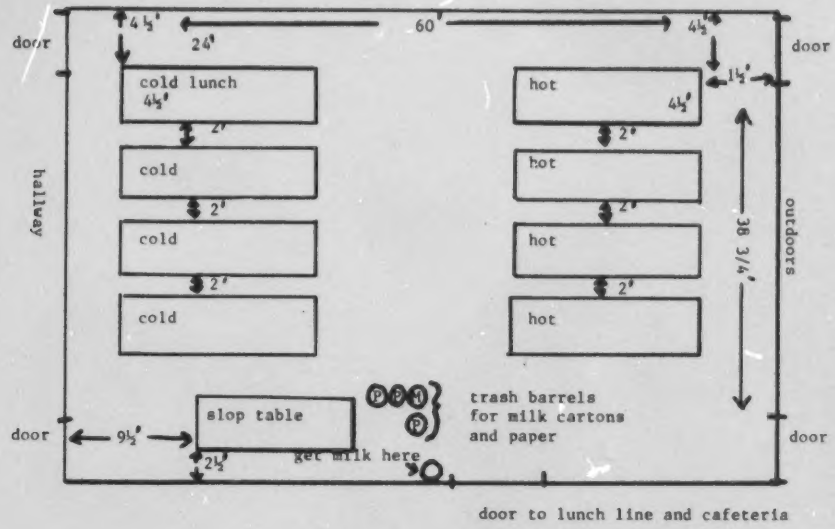


Figure C2-4



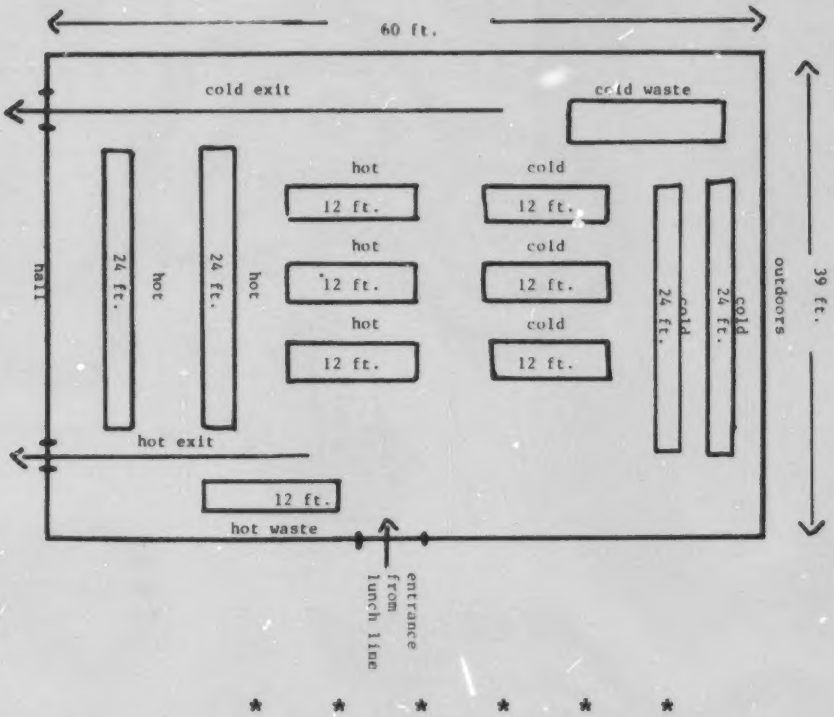
The Map Group tried several new arrangements of tables by moving the model tables around on the board. When they made an arrangement that they thought was an improvement over the existing situation, they made a sketch of it so that they could refer to it later. One child's sketch comparing the old scheme with a new plan is shown in Figure C2-4.

After discussing various alternatives, the children in this group decided that the best one involved rearranging the tables in both the hot and cold lunch sections and having students who ate cold lunches use different trash barrels and leave by a different door. They felt that this plan would improve the flow of traffic through the waste area and out of the lunchroom.* There was not time left in the year to try to get this plan implemented, and so the children decided to approach the principal with their idea in the fall.

On the next page is a sketch of the proposed arrangement. The new plan called for the elimination of one twelve-foot table in each section. The children did not deal with the problem of less seating space but planned to investigate

*The children could gather data on the traffic flow in the aisles under the present arrangement so that it could be used for comparison when the new arrangements are tried.--ED.

this aspect before submitting the plan to the principal in the fall.



* * * * * *

At the beginning of the following year, a group of students from this class decided they wanted to culminate their efforts to solve the lunchroom problems. During our first meeting, I asked the students what things needed to be done before they could approach the principal with possible changes. We reviewed the work that had been done the previous year. The students clustered around the same interest groups as the previous year: (1) wastage of food, (2) questionnaire data, and (3) rearrangement of the lunchroom.

At the end of the first meeting, a student interested in food wastage took the graphs and tally sheets with him to go over. Another student gathered the questionnaire data about the service line to reevaluate it. The girl working on rearrangement of the lunchroom took the two maps of the lunchroom arrangements (existing and proposed) and reexamined the previous year's plan.

Work on lunchroom problems was irregular because the students came from three fifth-grade rooms. The various groups met individually with me during recess times, but the group as a whole could not get together because of scheduling problems. Because they lacked feedback from other groups and because of other time commitments, some of the children became discouraged and did not try as hard as they might have to get their changes implemented.

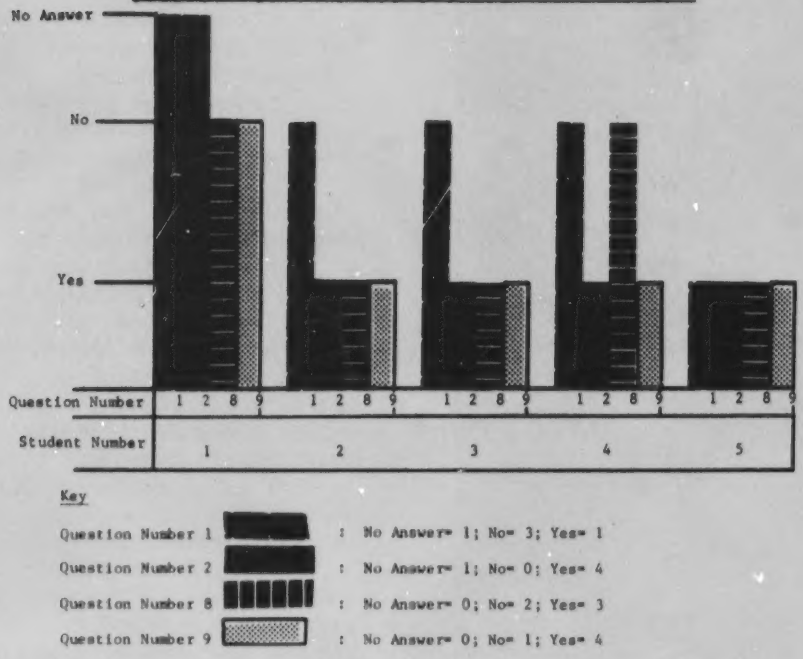
The boy interested in food wastage found another student to work with him on the problem. They decided that the evidence was adequate to show what kinds of food should be eliminated in order to prevent food from being thrown out. Students redrew their graphs in a more attractive way on 1/4" graph paper in preparation for presenting them to the principal. However, before this happened, one of the children talked informally with the principal about the problem. He told the student to see the business manager about wastage, but he also said that much of the food had already been purchased cheaply from government surplus supplies. This discouraged the children because it sounded like a situation that no one could do anything about. They lost interest in the problem at this point.

The boys working on a new consolidation of the questionnaire graphs completed their work. The result was an attractive, 3 ft. x 1½ ft. graph which they planned to use for presentation to the principal. A copy of their graph is shown on the following page.

I asked the children if they could explain what their graph showed. They responded that questions 1 and 2 showed that the servers enjoyed working and didn't have to work, while questions 8 and 9 showed that they were bothered by other kids and reacted negatively to them.

The children were interested in what the servers meant when they answered that they were "bothered" by other children. They asked the principal if it was all right for them to question the servers about this and other working attitudes. The principal told them that they would have to ask the lunchroom supervisor before talking to the staff. When the supervisor assented, the children conducted informal talks with the servers. Although the servers complained about the other students during these talks, they admitted that they could also be at fault for not being patient. The children noticed a slight improvement in the servers attitudes after these conversations. However, the group lost interest before working out any plans to improve the situation on a permanent basis.

New Consolidation of Questionnaire Graphs*


No Answer
No
Yes
Question Number
1 2 8 9 1 2 8 9 1 2 8 9 1 2 8 9 1 2 8 9
Student Number
1
2
3
4
5
Key
Question Number 1 : No Answer= 1; No= 3; Yes= 1
Question Number 2 : No Answer= 1; No= 0; Yes= 4
Question Number 8 : No Answer= 0; No= 2; Yes= 3
Question Number 9 : No Answer= 0; No= 1; Yes= 4

The three children in the group working on rearrangement of the lunchroom started with the following goals: (1) to scale down the original lunchroom model to a workable size and (2) to come up with a design that would provide more seating space than the previous year's plan.

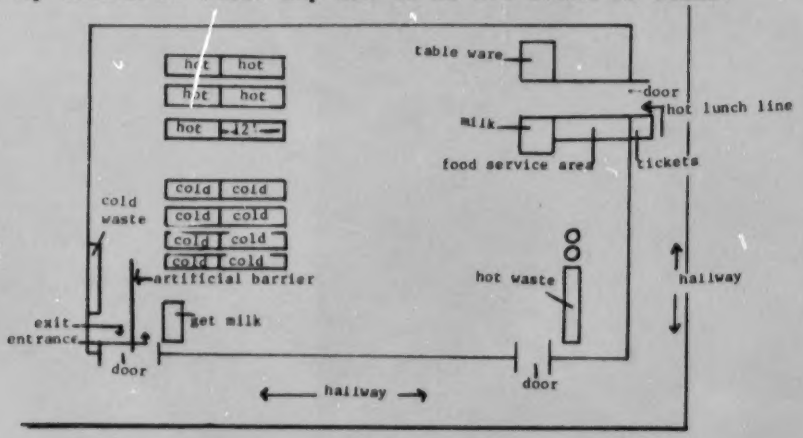
The group completed a neat, scaled-down model of the existing lunchroom (½ in.↔1 ft.) that was easier to handle than the original. Their model had movable tables for possible rearrangements.

Mid-way through the semester the children worked out a new design. The children proposed that students with cold lunches file past the cold waste disposal area in a single line. This plan would take the traffic burden off of the hot lunch disposal area. A sketch of their design appears on the following page.

*The children might be asked to think of other ways to show this data on a graph. A bar graph might be drawn showing the percentage of "yes" answers for each question. See Background Paper, *GR3 Using Graphs to Understand Data*.--ED.

New Lunchroom Design

The scale of the student's map was ¼ inch to 1 foot. This is my sketch of their map and it is not drawn to scale.



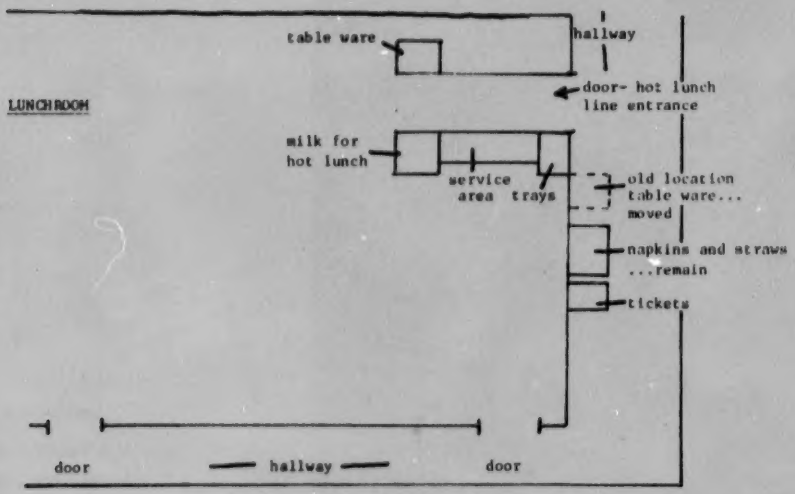
We went to the lunchroom and set up a rope barrier to see whether this were a feasible alternative. Twelve students were asked to "run" through their waste line. When this appeared successful, the children approached the principal with the plan. The principal agreed to a one-day trial of the system.

The trial was not successful because the lunchroom staff who cleaned up were not happy with the new arrangement. The children became discouraged due to the lack of support and most of the children dropped out of this group.

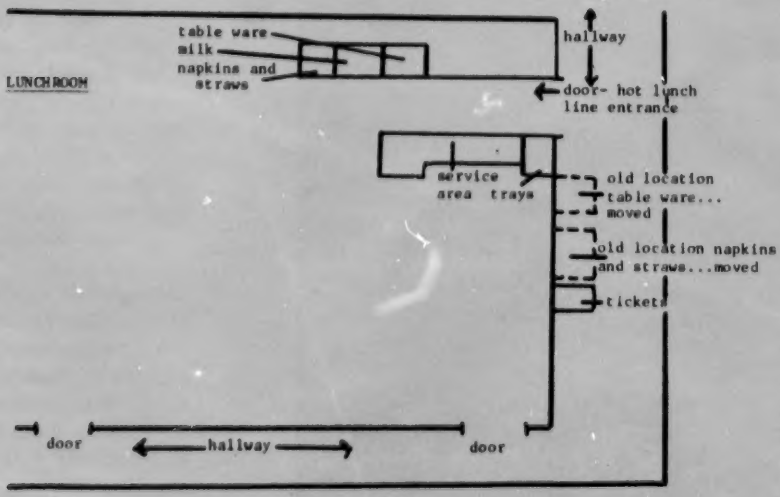
One of the group members began working on a problem related to lunchroom arrangement. During the previous year, a group had been tallying numbers of plastic forks and spoons that fell to the floor when they were being distributed to children. The group had perceived the problem simply as wastage of eating utensils and had dropped it after awhile. Tammy, however, felt that it was a health problem. She saw students taking tableware (and frequently dropping it) rather than waiting for it to be handed to them by a server with plastic gloves, thereby creating an "unsterile" situation. Other teachers had already noticed the situation and had complained to the principal.

Tammy's proposed solution to the problem was to move the tableware section from the beginning to the end of the line. Her rationale was that by the end of the line students would have their hands full and would have to wait for the server

to put utensils on the tray. Tammy's plan when diagrammed looked like this:



Unfortunately for Tammy, on the day that she had planned to present her idea to the principal, he rearranged the lunchroom on his own. The new arrangement, pictured below, was similar to her idea.

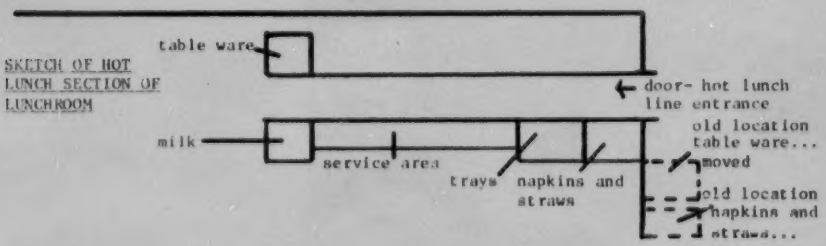


She observed the new arrangement and still felt that her proposed plan was better. The principal had put the tableware, milk, napkins, and straws on the right side. Tammy made the observations that (1) it was difficult for students to pick up napkins and straws (for which there were no servers) while holding a full tray and (2) traffic appeared to backup at this point in the line.

Tammy decided to observe the new arrangement carefully and to collect more data before going to the principal with her proposed modification. She and a helper began gathering ten to fifteen individual timings per day for this particular service area over a ten-day period.

Meanwhile, I met with the principal to bring him up-to-date on what had happened. He was interested in how the new arrangement was working and was willing to accept suggestions and comments.

A few other children joined Tammy in her efforts to modify the principal's arrangement. This small group decided on a plan that would include Tammy's arrangement for milk and tableware but would move the napkins and straws out of the hallway as the principal had proposed. The woman in charge of food service had observed to them that paper products were wasted and littered in the hallway. The group felt that children would spend less time playing with the napkins and straws before picking up their trays if these items were moved just inside the door. At the same time, the students still felt paper products should be left at the beginning of the line. Their new plan is shown below.



The students in the group received permission from the principal to try out this new arrangement. They found that on the first day, some of the students going through the line became confused and forgot to pick up their milk. The group decided to wait to time the new system when the children were more accustomed to the change.

Timings of the lunch line were taken the following day. Students were faster going through the line than before the change, but they were still confused by the new arrangement. One boy suggested that the openings into the lunchroom be narrowed by moving the table with the eating utensils nearer to the milk table. He decided on a thirty-inch width. This forced students to stop at this point while the tableware was being placed on their tray from one side and the milk from the other. The change was easier for the students going through the line as well as less time-consuming. The group continued to take timings and to look for improvements, but this basic lundhroom arrangement was kept during the rest of the year.

While we were working on lunchroom arrangements the woman in charge of food service asked us to help her with a problem. She complained that the first lunch period servers were too short to reach well across the counter. Since the fourth, fifth, and sixth grades ate during the second lunch period, the children had to be third graders. Our group decided to find the tallest third graders. The children went to each third-grade classroom, picked out the tallest children, and measured them. Then they ranked the heights from tallest to shortest. Several days later they asked the ten tallest third graders to come to the lunchroom and tested them by having them reach across the counter. They asked the teachers of these tall children to let them work in the cafeteria. This system worked well and was still being used by the school at the time this book was written.

3. LOG ON EATING IN SCHOOL

by Kathleen Schultz*
Heatherwood School, Grade 5
Boulder, Colorado
(October 1975-May 1976)

ABSTRACT

Children in this fifth-grade class tackled the problem of too much noise in the cafeteria during lunch time. To find out if the whole school thought cafeteria noise was a problem, the children took a survey of other classes. They found that talking and whistling disturbed a majority of children who ate lunch in the school. The children called several local noise pollution agencies and asked a county expert to discuss noise and noise measurement with the whole class. Some of the children learned how to use a sound-level meter lent by the county. The children divided into groups to research cafeteria rules and to work on four solutions to the noise problem: music, entertainment, posters, and a quiet contest. The children worked out the details of their solutions and then tested them by trying each for a week. During the trials, they collected sound-level readings on a tape recorder with a VU-meter which they hid in the cafeteria. The children added and averaged their readings for each day and compared high and low readings for each group. They found that the entertainment solution--showing cartoons during lunch--seemed to decrease the sound level the most. The group that held a quiet contest found that the second and fifth grades had been quietest, and they rewarded them by showing a Walt Disney film.

My class began work on our USMES challenge by discussing various sounds at school and whether or not they were unpleasant.** The children mentioned several areas in the school where they felt that noise was disturbing. Because they mentioned the lunchroom frequently, I asked how many people thought that it was a problem area. Fourteen raised their hands. Some of the children felt that only adults were bothered by noise in the cafeteria. However, someone suggested that we take a survey to find out how many people in the school were annoyed by lunchroom noise.

*Edited by USMES staff

**This class worked on a former USMES unit, Sound. The log is included here because the class challenge involved improving the lunchroom environment.--ED.

The children had never taken an opinion survey before, but they had been surveyed the previous year by two classes. We discussed how to begin. They weren't sure how many children were in the school, and so I sent one student to the office to get enrollment information (740 children). Another child was sent to find out how many eat in the cafeteria (350-375 per day).

Before we worked on the survey, we discussed the difference between sound and noise. After one child had defined noise as something that is disturbing, we decided that we wanted to eliminate noise but not all sounds.

The children voted to survey during reading period. After receiving permission from the principal to take a survey, we had to decide how we were going to administer it. The children listed the following choices:

1. Have a box for kids to place their votes
2. Have principal read questions over public address system (and kids vote)
3. Have kids in our class go around to classes, read questions, and count votes

The class favored the third option.

We spent part of this session and all of the next deciding what questions to ask on our survey. The children wanted only the students who frequently ate in the cafeteria to answer the questions. At first, they planned to ask the children who ate in the cafeteria more than half of the days in the week to respond. However, they calculated that anyone using the cafeteria twice a week would eat there a total of seventy-two times during the year. This seemed to be a large number of times, and so the children decided to ask students to respond if they had eaten in the cafeteria at least four times. As most people would fall in this category, they changed their question to "How many people usually don't eat in the cafeteria?" so that the numbers would be easier to count.

The other questions the class decided to ask related to the noises themselves. Suggestions were--

- Does talking in the cafeteria bother you?
- Does the whistle in the cafeteria bother you?
- Does any other noise in the cafeteria bother you?

The children divided the twenty-six classes among themselves so that each person would give the survey to one

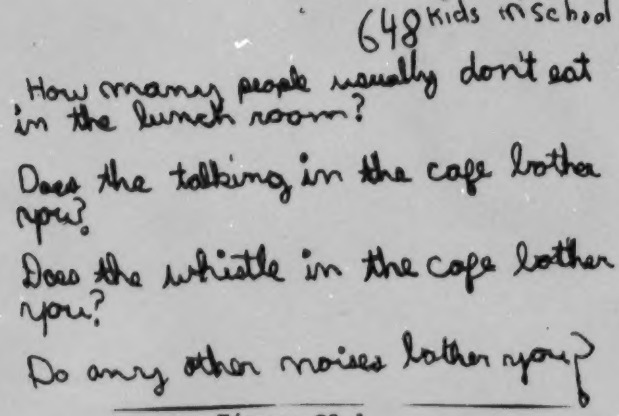

648 kids in school
How many people usually don't eat in the lunch room?
Does the talking in the cafe bother you?
Does the whistle in the cafe bother you?
Do any other noises bother you?

Figure C3-1

class. Because there were only twenty-three students in our class, three students had to survey two classes each. On the day we gave the survey, each student went to the class for which he/she was responsible and read the questions aloud. He/she jotted down the numbers of children responding to each question. One child's copy of the survey is shown in Figure C3-1.

During the next USMES session we spent forty-five minutes compiling the surveys that were completed. (Others were added later.) The children were concerned about the accuracy of the surveys. We listed and discussed the following problems:

1. Not everyone in each class voted.
2. Some voters couldn't make up their minds, and so people taking surveys didn't know how to interpret their votes.
3. Some teachers gave people taking surveys the number of children present that day; others gave the regular enrollment. Question: how many did we really survey?

At this point one child suggested that we check at the office to find out how many children were absent on the day we surveyed. We discovered that thirty-nine people were absent and subtracted these from our total:

```
  648 (738 students - 90 kindergarteners)
- 39 absent
  609 surveyed
```

The children had a good practice session while adding answers. One child's copy of the totals (including classes added later) is shown in Figure C3-2.*

The last question had generated a long list of disturbances, as follows (tally marks indicate the number of times the item came up):

1. Booing ~~||||~~ |
2. Popping bags ||
3. Saying "Ya" ||
4. Banging lunch boxes ||||
5. Spilling trays ||

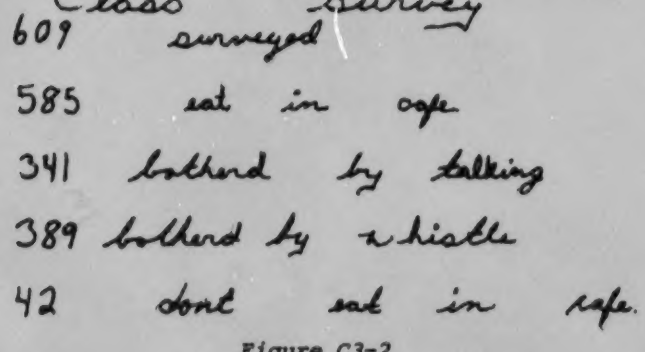


Figure C3-2

*The children might make a bar graph to show the results more clearly.--ED.

6. Spoons in washing bowl ||||
7. Yelling ~~||||~~ |||
8. Banging trays |||
9. Stamping feet |
10. Throwing food |||
11. Banging hangers (coats are hung on one side of cafe) ||
12. Bell ringing |
13. Crying |
14. Always having to move up at tables ||
15. Trading food ||
16. Tripping |
17. Singing |
18. Janitor speeches ||

We discussed how important an item was if only one person suggested it was a problem. We also noted that many of the problems weren't related to sounds at all. During the following USMES session, the children went through the list and eliminated all the complaints that did not pertain to sounds or that a majority of our class did not feel were problems. The items remaining were booing, yelling, banging hangers, and janitor speeches.

The children discussed whether or not we should survey to see if these sounds actually disturbed most people in the school. I tried to discourage a second survey because the first one had taken two weeks to complete. I pointed out that we already knew that talking and whistling were annoying to most people and that perhaps we could work on these incidents. The children decided that if we were to give another survey, we should be more specific and include other sounds.

We discussed the talking problem in the cafeteria. The children agreed that we didn't really want to eliminate all talking in the cafeteria; we only wanted softer talking. This led to the question: How loud is loud? Some children felt that "loud" meant you had to shout to be heard. After some discussion the children agreed that we needed to decide more definitely what "loud" was so that we could determine whether or not we had made a change.

One boy suggested that we find a "sonar" device to measure sound in the cafeteria. The children at first felt this was unrealistic because they could not imagine anyone having such a thing. We discussed devices that could be used to measure the loudness of sound, such as tape recorders hidden under the table. Someone suggested using a radio by seeing how high the volume dial had to be turned

up before a person speaking could be heard. The children thought that we could try this test both before and after putting up posters asking people to be quieter. The children divided into groups to work on installing measuring devices such as the radio and the tape recorder.

The Radio Group dropped the idea of using the radio to measure sound levels because no one really understood how this would work. The children in the Tape Recorder Group, on the other hand, had figured out how to hide the microphone in the rafters and were eager to pursue this idea.

On the following day, the Recorder Group appeared with recorders, microphones, and tapes. The children asked the janitor to help install the microphones in the rafters. They taped cafeteria noises, and we listened to the tapes as a class. We began discussing various ways to lessen the cafeteria noise. Suggestions included--

1. Make posters
2. Add music
3. Contest for the quietest class
4. Put up a list of cafeteria rules

Some children questioned the idea of adding music because they felt this would contribute to the sound problem rather than eliminate it. Others argued that according to our survey, it was talking and whistling that annoyed people, not sound in general.

The children were enthusiastic about the idea of having a quiet contest. They wanted to give ribbons each day and a prize (perhaps money!) to the class with the most ribbons after a certain length of time. The main problem with this idea seemed to be the question of judges; the cafeteria supervisors did not stay for the whole lunch period. Someone suggested that we hide a tape recorder in the rafters and let that be the judge.

The idea of "bugging" each table in the lunchroom intrigued the children. We talked about bugging and its legal consequences. Everyone had heard of Watergate, but no one was sure what kinds of bugging were illegal.*

I also brought up the idea of sound ordinances, and we discussed how the loudness of sounds were measured. The

*The teacher might ask the students how they would feel if they found out later that another class had bugged their conversations in the lunchroom. They might discuss when it would be okay to be tape recorded and when they would find it objectionable.--ED.

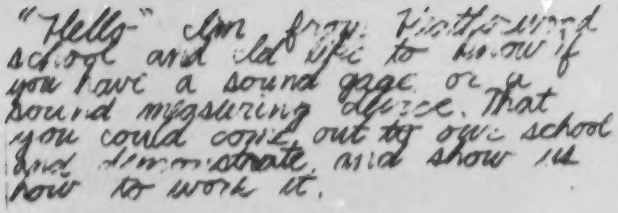

"Hello" I am from Fairview school and I'd like to know if you have a sound gage or a sound measuring device. That you could come out to our school and demonstrate, and show us how to work it.

Figure C3-3

children looked up the names of agencies in the Boulder City Government that might have information on noise pollution and sound devices.

The children decided to call four government agencies and the university about sound devices. To make the phone calls, the children divided into teams of two to think about what they wanted to say over the phone. Then they practiced by reading their questions to the rest of the class. One group's notes for their call to the Environmental Protection Agency is shown in Figure C3-3.

In response to the children's phone calls, Mr. Lemur from the County Office of Air Pollution Control visited the class. He discussed noise pollution with the class and demonstrated the use of a sound measuring device called a sound-level meter. He taught three boys how to use it and they collected some data on sounds in the cafeteria. We were lent the sound-level meter so that we could make our own sound measurements.

Several weeks later, we examined the sound-level meter and the children decided the following:

1. We should take readings in an organized fashion so that graphs could be made from them.
2. We should average readings taken over a specific period.
3. We should establish an absolute lunch time schedule for each grade. (One student went to the secretary about time schedules.)

One student who knew how to work the sound-level meter demonstrated his knowledge to the rest of the class. He also told us that Mr. Lemur had said that the machine picked up noises only at right angles.

The class explored the idea of making our own sound measuring device to use for testing our solutions. We discussed the scientific method and the concepts of variables and constants in experimentation. The children realized that they should keep as many factors as possible constant when testing for volume; e.g., the microphone should be put in the same place, the setting should be the same. We discussed how we could eliminate as many variables as possible when conducting our tests.

When we examined the sound-level readings we had collected with Mr. Lemur, we noticed that the readings were in decibels. All we knew about decibels was this: a reading of 90 decibels or higher is harmful to the ear, and a

range of 60-70 is comfortable. We decided that we needed more information on sound and hearing, and the children worked in pairs looking for information in the encyclopedia, dictionaries, science books, and the library and catalog. We listed the following topics as areas of research:

1. Listening
2. Sound (meter)
3. Ear
4. Decibel
5. Noise
6. Eardrum
7. Health
8. Deaf
9. Audiometer

The children spent about twenty-five minutes researching information and then reported in teams. Their research had led them to all sorts of interesting topics from logarithms and exponents to care of ears. We confirmed Mr. Lemur's information that sounds measuring 90 decibels were harmful. The group who had worked with him using the sound-level meter claimed that they had taken one measurement of 90 decibels, but no one remembered when it had occurred. (We suspected that it was during the singing of "Happy Birthday.") We decided that it might not be necessary to change the sound level in the cafeteria for health reasons but that it was still a problem because it bothered people.

During a class discussion we decided to break into groups to work on various aspects of our challenge. Some of the children felt that it might be helpful to find out exactly what cafeteria rules existed so that we would know whether new ones needed to be made about noise. A committee of three children formed to interview janitors and the three aides who supervised during lunch period. They also decided to publicize the rules that existed so that everyone would know about them.

The other groups formed around various suggested solutions to the noise problem. A group formed to make posters asking children to keep the noise down in the cafeteria. A second group formed to work on playing music during lunch period. A third group of children wanted to make plans for lunch time entertainment, such as movies or theatre. A fourth group formed to work on the quiet contest between grade levels. These four groups planned to work out their solutions and then test them by measuring the sound level in the cafeteria when each alternative was being tried.

The class discussed the various solutions and the problems with each that needed to be solved. They were concerned about how the Music Group could survey the school to

NOTES OF The Poster Group

Draw 5 posters, We are drawing posters

Janeth
Julie K.
Pam A.
Lura C.
David T.

Ideas

① Ear drum popping out.
② Wire hand sticking out pointing at you
③ A horse coming out of the cafe with ear muffs on.
④ A Cat sitting on the table with ear muff on.
⑤ A mouse sitting under the table pluging his ears.

Figure C3-4

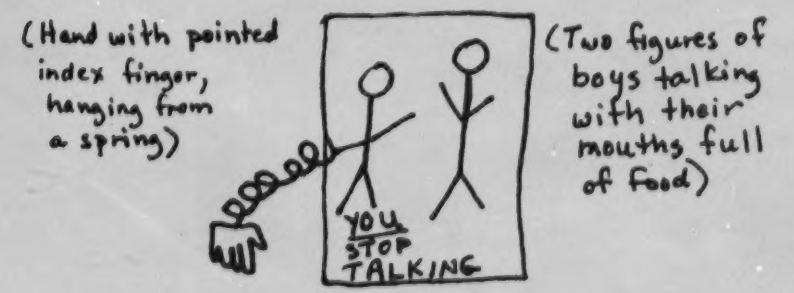
find children's preferences for music. The problem of obtaining record players and records was discussed. Students were also concerned that some forms of entertainment created by the Entertainment Group might make people stay in the cafeteria after they ate, leading to a crowding problem.

Problems with the Contest Group's solution were also mentioned. To compare grade levels, seating would have to be rearranged so that everyone in each grade level was sitting together. Questions asked included: Should children or adults be the judges and what would be the criteria for judging?

Each group chose someone to take notes on group discussions as well as a representative to ask permission from the principal. During the next few weeks the children worked primarily in groups, although we met periodically for class discussions.

The Rules Committee conducted their interviews of adults supervising the cafeteria and discovered about ten rules for behavior. They made three posters stating these rules and put them around the cafeteria for other children to see. When their tasks were completed, they combined with the Poster Committee to make posters requesting people to be quiet in the cafeteria.

The Poster Group worked on several original designs for posters. Many of the ideas were quite elaborate and involved springs coming out of the cardboard, cutout figures, etc. (See Figure C3-4 for the groups' list of ideas for posters.) Below is a diagram of the first poster to be completed:


(Hand with pointed index finger, hanging from a spring)
YOU STOP TALKING
(Two figures of boys talking with their mouths full of food)

When the Poster Group had completed its posters, the children worked on the problem of measuring noise levels with a sound measuring device. Before we could actually use the sound-level meter for our testing, we had to return it to

the county. Since we could not locate another, we decided to take the advice of our district media specialist and use the VU-meter on a school tape recorder. I explained how the recorder worked to the group and the children practiced using it.

The Music Group still hoped to take a survey of children's preferences for music (as suggested earlier in a class discussion). The children felt that choosing songs might be a problem because sixth-graders would like different kinds of music from first-graders. They decided to make a list of all the records they planned to bring in and to ask each child to mark his/her first, second, and third choices. Then someone remembered that first graders wouldn't be able to read the survey, and the group decided they would read the choices to them. However, the list had grown to 140 records, and the children realized that reading a list of this size would be impossible. At my suggestion, we tried out the survey on the class to find out what other children thought of the records selected. We discovered that only six out of fifty-two songs were known to nearly everyone.

After considerable discussion the group decided to give up the idea of taking a survey. They planned to play a variety of records and to simply observe which ones seemed to make children talk less (and listen more), but they never got around to it.

The children spent several sessions discussing how to set up the record player and speakers in the cafeteria. They also divided into teams for operating the record player during their trial period. The children in this group did not work very well together, but they remained interested in their purpose even when it meant missing recess period and lunch hour to set up and dismantle the record player and speakers.

Two girls in the Entertainment Group worked on papier mache heads of Charlie Brown and Snoopy for committee members to wear while walking around asking children to be quiet. The same girls also wanted to put on a puppet show. One boy's father offered to lend the group a video camera so that they could tape Saturday morning cartoons to be shown during lunch. The children hoped that if they repeated the same cartoon for each grade level, no one would want to stay to see it again; then the cafeteria would not only be quieter but would not become crowded.

To find out how long the movies needed to run, some children in the group borrowed stopwatches and timed the children

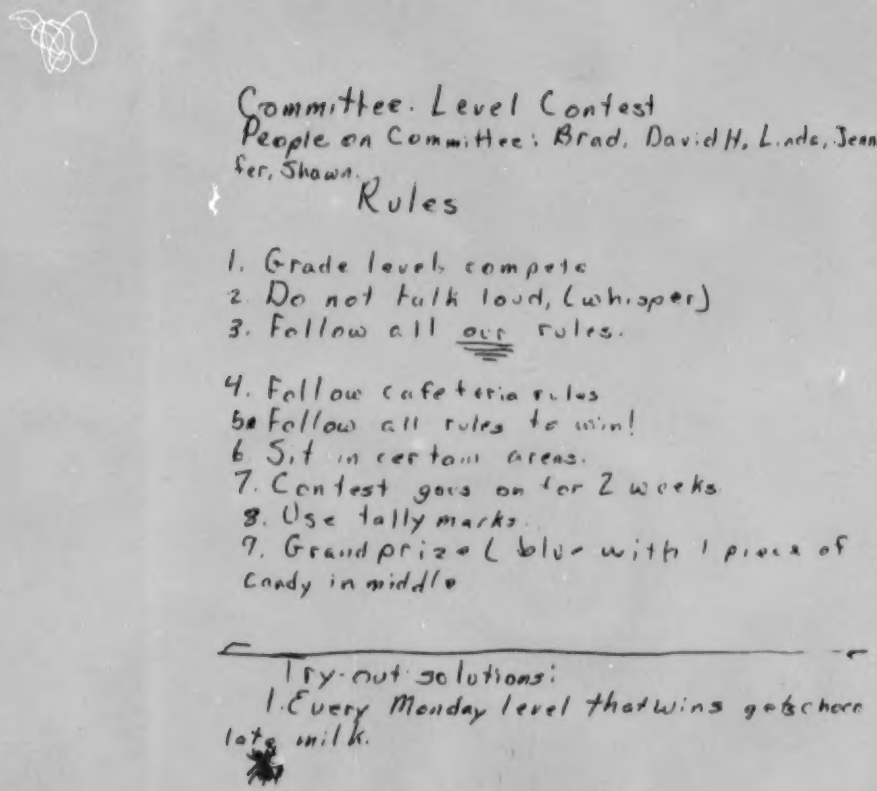

Committee. Level Contest
People on Committee: Brad, David H, Linda, Jennifer, Shawn.
Rules
1. Grade level compete
2. Do not talk loud, (whisper)
3. Follow all our rules.
4. Follow cafeteria rules
5. Follow all rules to win!
6. Sit in certain areas.
7. Contest goes on for 2 weeks
8. Use tally marks
9. Grand prize (blue with 1 piece of candy in middle
Try-out solutions:
1. Every Monday level that wins gets chocolate milk.

Figure C3-5

from each grade eating lunch. They also wanted to time children in the lunch line but never completed collecting this data. They did complete the taping of some cartoons to be used as entertainment during their trial period.

The Contest Group at first wanted their quiet contest to run several months, but when we discussed our plan for trying out the four different solutions, they settled on a one- to two-week experimental period. They decided that they should tell children when the contest was going on. Chocolate milk or ice cream was planned as the prize for the winners.

I advised them to check the chocolate milk idea with the cafeteria staff. Much to their dismay the head nutritionist said that no one could have chocolate milk. She told them the cost of buying it for prizes, and the children agreed that they could not pay for it themselves. (They didn't think of raising funds as a class.) We discussed other types of rewards, and they decided that our prize did not have to be something to eat.

The children made two large drawings of our Heatherwood Hero (mascot) out of cardboard and magic marker. They planned to give one to the winning class of the quiet contest for the lower-grade levels and another to the upper grade-level winners along with another reward that they still had not determined. They also voted to have one girl in the group announce the contest over the intercom, but the girl declined. Another child volunteered to do it and received permission from the group. The children in the committee established a list of rules for the contest to be read over the intercom. (One child's copy of the list is shown in Figure C3-5.) The students also worked on signs to be put on each table indicating where each grade level should sit.

I showed the tape recorder and the VU-meter to this group as well as to the others. I explained how to use the scale on the instrument and how to handle it carefully so as not to damage it. As they were concerned that the meter might fluctuate widely, they planned to take a reading each minute for ten minutes and average their readings. After ten minutes, they would take readings for the next grade level entering the cafeteria. The children made the chart shown in Figure C3-6 to use while recording their data.

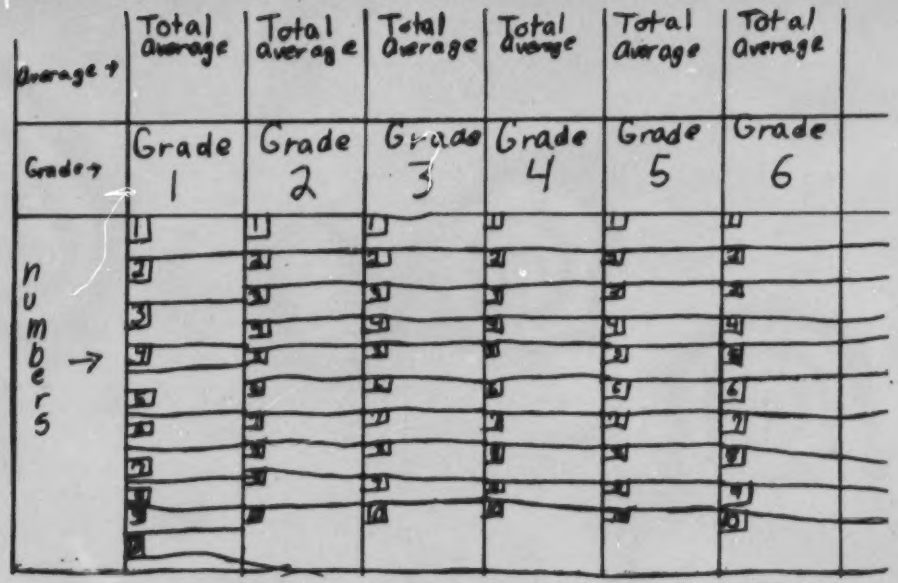


Figure C3-6

We decided that we needed to take readings of the existing noise level in the cafeteria before beginning the trial runs of the four solutions. We planned to test each solution and measure the noise level for a week. The order of the groups was as follows:*

First week - Rules and Posters
Second week - Music
Third week - Contest
Fourth week - Entertainment

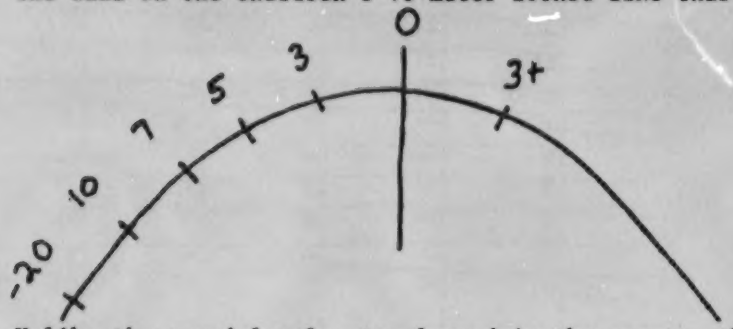
As a class, we discussed how the readings should be taken. We decided on a procedure similar to the one suggested by the Contest Group, but we decided to take readings every two minutes instead of every minute. Since a class entered the cafeteria every ten minutes, there would be five readings for each class every day. Thus, readings would be taken between 11:30 A.M. and 12:30 P.M. Stopwatches would be used for recording times at which readings were taken.

Before starting their readings, the Rules and Posters Group set up their equipment in the cafeteria. The microphone was suspended from the ceiling in the center of the

*The children might discuss how the order of the groups could affect the outcome. Do some solutions have carry-over effects? Would there be a difference if the Poster Group went last instead of first?--ED.

room so that it would pick up noise from all areas. The recorder was placed in the area reserved for coats and parkas. The children began timing each grade as it came into the cafeteria and took readings every two minutes until the next grade came in. This way, they hoped to have a fair selection of readings of the sound level over lunch hour.

The dial on the children's VU-meter looked like this:



Unlike the sound-level meter loaned in the county, the VU-meter dial had numbers that were relative, not absolute. They could be low or high depending on how the dial was set. Repeatedly, I stressed the importance of keeping the dial on the same setting so that our readings would be accurate. (Even so, we later had to discard some data because the dial setting had been changed.)

We had our dial set so that most numbers fell in the negative end of the scale. The lower the sound level, the smaller the number (e.g., reading of -10 meant a lower level of sound than a reading of -5). Here is one set of data collected by the Rules and Posters Group while they were still testing sound levels in the cafeteria before the trial of their solution:

		Monday
Grade 1	11:30	-10
	11:32	-10
	11:34	- 5
	11:36	- 7
	11:38	-10

We debated what to tell other children about our testing. The students did not want them to know what we were doing for fear that they would make more noise than ever. We

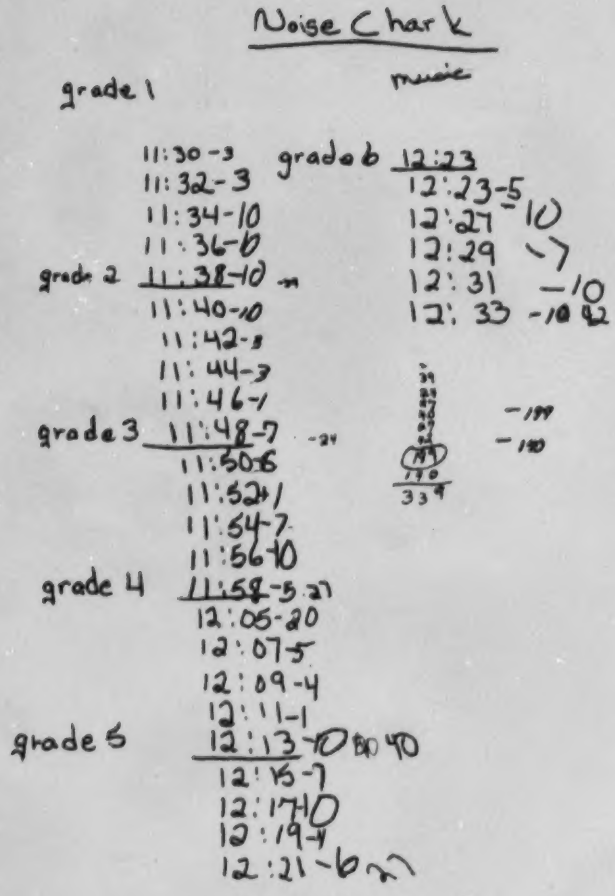


Figure C3-7

decided not to invent stories but to tell them we were testing and would explain our results later.

While the Poster Group was collecting sound data in the cafeteria, we were asked to give a presentation to the Boulder P.T.O. We decided to have each group elect a representative to tell the parents about the groups' solution. Two additional people were selected (from the Rules and Posters Group) to explain our VU-testing procedures. The representatives prepared for their presentations by writing a summary of the group's activities so far.

After the presentation, we reviewed the data collected by the Rules and Posters Group. We decided we would take averages of readings collected and compare them for each solution.

The children tried their four solutions over the next month. The trials went unevenly: some solutions were obviously working better than others. The Music Group had the biggest problem. On the first day that they played music in the cafeteria the aides complained about the noise. We discussed the problems as a class and came up with the following suggestions:

1. Change the style of music
2. Find songs the little kids like
3. Make a sign saying "No Requests"
4. Change the physical arrangement of the record player and speakers

This group of boys did not readily accept suggestions, but they tried some of these ideas the next day. However, the aides still felt that it was too noisy and disorganized and that the children in the group were uncooperative.

At this point I told them that they would have to come up with a solution that the aides agreed to before they could try again. After a few minutes of debate they decided to give up on the music solution after only two trials. (The group's chart from one of these trials is shown in Figure C3-7.)

The Contest Group had a special problem. Because they were comparing sound levels of different grade levels, they needed to be as accurate as possible while measuring each grade. They hoped that the staggered schedule of the different grades would help them determine how much noise each grade was making. They also considered moving the microphone around to different sitting areas so that it would be closer to the noise source, but decided that their read-

To Teachers
Mrs. Schultz's 5th grade class is having a contest to see which grade level can be the quietest in the lunchroom.
If your class was in the grade that won would you let them do any of the following?

- ☐ Movie (during class time)
- ☐ Cookies (baked by our group).
- ☐ Candy
- ☐ Eat lunch in area if you agree.

Thank you
Mrs. Schultz's 5th grade

Comments:

Figure C3-8

I love an announcement to make. I am ( ) from Mrs Schultz class. Today in the cafe we discontinued the cartoon because the screen was to small and people were gathering in front of it. Tomorrow we will show cartoons if it works out. The purpose of the cartoons is to help the cafe quiet in a fun way
Thank You

Figure C3-9

ings would be less accurate than when the microphone was kept in the same place.*

The children in the Contest Group decided to survey the teachers in the school to find out which prize (of four possible choices) they felt would be best to offer the winning class. The survey, which they dittoed and distributed to the teachers, is shown in Figure C3-8. The children decided from the results of the survey to reward the class that made the least noise by showing a movie.

The Entertainment Group found that experiments with cartoons went well although they could not obtain large T.V. screens to set up in the cafeteria. Instead, they used a tiny T.V. set that had a 7" x 7" screen. During the first trial they decided the screen was a problem because children crowded around it, and they stopped the trial after fifteen minutes. However, the children explained the situation to the rest of the school in an announcement over the intercom (see Figure C3-9) and thus enlisted the cooperation of other students. They were able to continue their trials although a larger screen could not be found.

Before the Entertainment Group had completed collecting data, we discussed the numbers the children had recorded on their noise level charts. Since the figures were both positive and negative, we first reviewed the number line and plus and minus numbers. We talked about how you jump ahead in the number line for positive numbers and back for negative numbers.

We started analyzing our data by examining the various charts. The Music Group had quit after two days and the Contest Group had taken three days' readings with the VU-meter dial set wrong (all the readings were -20), but we decided that we would use all of the correct data that was available.

The children began totaling all the VU-readings for each day. We talked about the fact that they were taken according to grade level, but we decided that only the Contest Group, which had to choose the quietest class, needed to compare data among grade levels. The children in this group added the readings for each grade level first and then added these together to find the daily total.

As they added, the children found that for some days there were more measurements than for others; thus totals between groups and within groups were not comparable. We

*The children might draw a sketch of the lunchroom to compare the distances of the microphone to the various sitting areas.—ED.

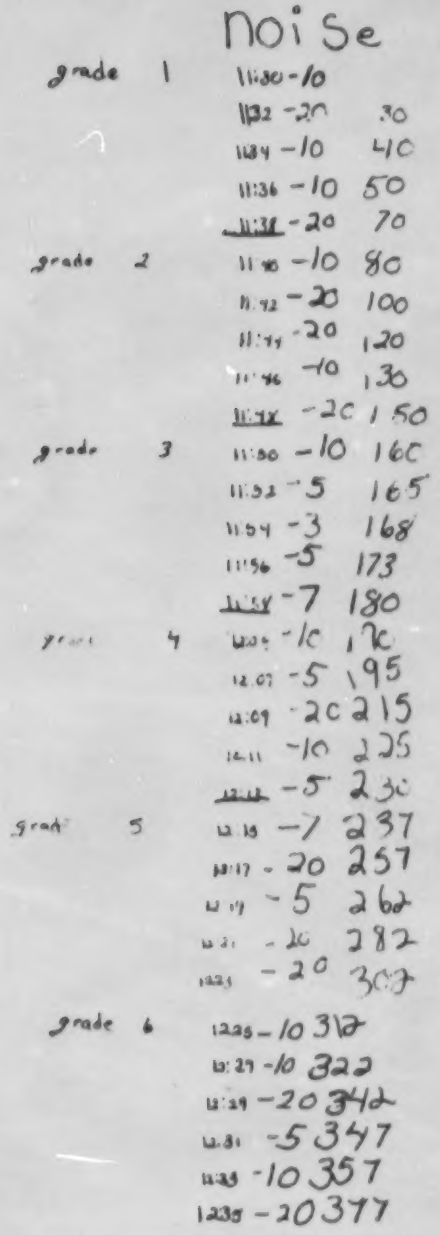


Figure C3-10

discussed what we should do in this case. Some children wanted to count only measurements taken until 12:30 P.M., but I explained that they could take averages that would give us numbers that could be compared. We practiced by finding an average on the board, and then the children worked on their charts in groups.

We finally completed our evaluations during the end of May. After finding daily totals and average sound levels for each day, we chose the loudest and the quietest for each group. Below are the loudest and quietest readings recorded by the four groups over their trial periods (as totals, not averages):

	Quietest	Loudest
Rules and Posters	-116	- 7
Music	-199	-140
Contest	-199	- 20
Entertainment	-377	-312

Our evaluation showed that the entertainment solution seemed to keep the noise level in the cafeteria lower than the other groups' solutions. The "quietest" chart from this group showing meter readings and running totals is shown in Figure C3-10. We decided to continue taping Saturday morning cartoons and showing them during lunch hours for the remaining eleven days of school.

The Contest Committee found that the second grade and the fifth grade had won the contest by being the quietest the most number of days during the sound-level testing.* The children obtained a movie catalog from the librarian and ordered a Walt Disney film to show the children from these grades.

During a discussion about taping cartoons I brought up the issue of the legality of taping movies. The children, however, felt that it was too late to do anything about this issue in the remaining eleven days of school.

*The children might show this graphically by making a histogram of the results for each grade. A comparison of the histograms would show which grade was quietest.--ED.

4. LOG ON EATING IN SCHOOL

by Kathryn McNenly*
Allen Street School, Grades 5-6
Lansing, Michigan
(September 1975-June 1976)

ABSTRACT

Children in this sixth-grade class worked on the Eating in School challenge every morning starting in late September and continuing until the end of the school year. With the help and support of the principal, the children took over the operation and management of the federally-funded breakfast program for the school. Working in committees, they set up the tables, food, and eating utensils in the morning, operated the breakfast line, cleaned up after breakfast, ordered food supplies, and handled the monetary transactions. The children constantly evaluated their work and tried to correct various problems that arose. They ordered and received a new cooler for keeping milk, developed a system for determining amounts of food to order by estimating numbers of breakfast eaters, and eliminated unpopular juices and Pop-Tart flavors by counting wasted food and taking preference surveys. The children were discouraged by governmental regulations in their efforts to improve the nutritional quality of the breakfasts, and they could not get hot breakfasts because of the lack of facilities at the school. They received many complaints about dirt and hair in the food and wrote three letters to the cereal manufacturer. In the spring, they went on a tour of the cereal factory and interviewed a representative who told them that the food was clean by U.S. Government standards. Because of the children's efforts in running the program, the school became the prototype of the federally-funded breakfast programs in Lansing, and a film was made of interviews with children, the principal, and the teacher.

Before the school year started, I had already identified the federally-funded breakfast program as a possible focal point for an Eating in School challenge. The program, funded under Title I, provided (1) free breakfasts for children from low income families, (2) breakfasts at reduced rates for children from families with slightly higher incomes, and (3) seventy-five-cent breakfasts for anyone else who wanted them. The program had been new to the school the previous

*Edited by USMES staff

year. I thought that the children might help it function more smoothly if they had some input, and so I decided to introduce this idea to my class.

I began the unit by asking the class: "How did breakfast go this morning?" There was a lot of mumbling that I couldn't decipher. When I asked individual children, we came up with a list of complaints:

- no milk
- terrible juice (tangerine juice)
- graham crackers were soggy, stale, or dry
- clean-up was a mess
- someone slopped a whole bucket of water on the floor
- too noisy
- kids behaved badly
- crowded
- not well-organized
- not enough help

Because of a stigma attached to reporting low incomes, only eight children in my class had returned slips and were receiving free breakfasts. One child paid 75¢ and two "safeties" (helpers) received breakfast free for their aid. This left about two-thirds of the class uninvolved in the breakfast program and not very interested. I decided that a direct introduction of the challenge would be most likely to elicit a response. After I asked them how they could improve eating in school, there was some interest in becoming involved.

By the next session, more slips had been returned, entitling five additional children to free breakfasts. Three nonparticipating children had volunteered to observe during the last class and two more safeties were helping with serving and cleaning up. We started the session by discussing the previous day's menu. Breakfast had consisted of Applejacks cereal, milk (some said too warm, some said too cold), and the "unfavorite," tangerine juice. The following criticisms were made:

1. Not enough to eat
2. Not enough time to clean up
3. Too much unwanted juice left on table
4. Clean-up was disorganized
5. Kids and safeties ran around too much

The next day's menu consisted of Fruit Loops cereal, milk, and apple juice. The problems were:

1. Not enough milk to go around
2. Thrown away milk was all over the floor
3. Ms. Y.'s kids were terrible
4. Kids wouldn't get in line after breakfast
5. Kids at other tables pulled your hair
6. Too many kids come at one time
7. Wednesday was supposed to be peanut butter cookie day (no cookies)
8. There aren't going to be any Pop-Tarts this year (rumor?)
9. Too many safeties downstairs
10. Too noisy in the gym (where breakfast is served)
11. Hands that serve the food aren't very clean

While we were discussing these problems, some possible solutions came up. One child suggested that classes should enter the gym at five minute intervals to prevent the crowding problem, but the class decided this would take too much time. A student who had not had USMES the previous year suggested that we take a survey to find out what kids would eat. This idea was greeted enthusiastically by children who saw it as a way to banish the unpopular tangerine juice and to reinstate Pop-Tarts and peanut butter cookies. All in all, I felt encouraged by the interest shown by the class and began to feel that they saw the breakfast program as a real problem.

During the next week, we continued to collect observations and to listen to complaints from other children. After reviewing two more days' menus, one child suggested that we start doing something. The rest of the class seemed to share his impatience. After further discussion the children decided we didn't have enough real information about how the program was run. They decided we should invite the principal, Mr. Henderson, to the classroom to give us these facts.

Another point was brought up during this meeting, fortunately by the children themselves. Six children in the class had already been removed from helping with the breakfast program because of boisterous behavior (apparently, knocking over tables and throwing dirty sponges at one another). The children realized that if they were to be responsible for running the program, they would have to

learn to control their own behavior. They decided to be well-behaved between 8:45 A.M. and 9:15 A.M. (One student suggested taking an oath, but they tabled this idea until they could be sure they would be allowed to run the program.)

Before the principal's visit to explain the program to us, we discussed some of the things we needed to learn about, such as food ordering, handling money, placing long-range orders, and dealing with problems. Since the children did not know how to work well in groups, they wrote down questions to ask the principal individually.

During the next session, the principal came to talk about the breakfast program. He started by explaining that the program originated in 1974 as a means of helping children get a better start in the morning. He explained that there were three foods served each morning: (1) milk, (2) juice, and (3) cereal or cereal substitute. The program was being directed by someone from the high school and junior high school. He said that the supplies purchased so far--twenty-five cases of cereal, twenty cases of juice, and one case of graham crackers--had lasted one month. Milk was ordered from the dairy twice weekly; the amount ordered was calculated from breakfast orders, with an additional case to guard against spillage or spoilage. Each Monday, teachers recorded free and paid breakfasts for the week. The milk orders were reported weekly to food services and all milk receipts turned in.

The principal told us that he would be delighted if we took over the program, including ordering, collecting money, and depositing it in the local branch of the bank. All of the duties of the secretary and himself and some of the duties of the custodian would then be absorbed by us.

During the rest of the session, the principal fielded questions from the children. Some of the discussion went as follows:

STUDENT: How do you order milk?

PRINCIPAL: Check the milk against the daily consumption and look at dates on the cartons. When you run low, call the dairy immediately and reorder.

STUDENT: What if it's late or sour or frozen?

PRINCIPAL: That's something we'll all have to work on with the dairy. They haven't been good so far.

STUDENT: What do you eat when there's no milk?

PRINCIPAL: Try cookies or graham crackers and juice. Most kids seem to like this. You'll just have to develop emergency procedures.

STUDENT: What about bad kids?

PRINCIPAL: The person who monitors kids can't be beating on them. Sure, they shouldn't act silly, but they do. You'll have to find ways to stop that by treating them the same way you would want to be treated.

Other questions about discipline problems arose. The principal stressed the importance of being fair to both sides in a dispute and offered his assistance in extreme cases. The children also inquired about payment and ordering. He explained that once the money was deposited in the bank, there was an automatic draw. Food must be ordered a week in advance so that it would always be delivered on time. Ordering was based on a six-week usage period. If there were not enough food, anyone who had paid but could not get breakfast was to be given credit.

After our talk with the principal the class voted twenty-eight to one in favor of taking over the breakfast program.

The next session was spent dividing into groups to work on the administering and daily functioning of the program. At the beginning our activities were as follows:

- Readying--pouring juice, separating cups, getting milk from coolers, putting out food (four students)
- Starting--card making, food passing (four students)
- Ending--in charge of lineup, throwaway, walk-out (four students)
- Cleanup--disposing of trash, washing tables, putting tables against wall (four students)
- Problems--policing behavior, breaking up fighting, speeding up line (whole class would do this)
- Ordering--ordering and reordering, surveying for food preferences, checking supplies, etc. (four students)
- Money--collecting, counting, room deposits (four students)

When groups and tasks had been determined, the children decided that they would start with the part of the program that applied to eating rather than paper work. This would ease them into the management of the program slowly. The question of whether or not we could switch jobs came up,

but we left this decision to be made after we felt more experienced.

On the first day of operating the breakfast program, the groups involved in setting up, processing cards, passing out food, and cleaning up began work at 8:10 A.M. When we met at 10:30 A.M. to evaluate the experience, many complaints arose. Children had been angry because some of the milk was spoiled. Someone then remembered we were supposed to check the dates on the cartons. This turned out to be the responsibility of the Ordering Committee. (When they checked, they found that 16 out of 445 cartons were marked October 13 instead of October 18 and were therefore not to be served.) We also discussed what to do when juice was returned because it was so unpopular. They remembered that the Ordering Committee was responsible for taking a preference survey to find out what juices people liked best.

All the groups had some complaint to make. The clean-up crew had trouble closing up the tables. The group responsible for setting out food criticized other children for grabbing it. The Readying Committee needed more milk coolers. The card processors complained about students who played around with their cards and wouldn't show them.

We discussed various solutions to these problems as they arose. The students felt strongly that we needed to make rules and enforce them. They decided that when they made up a list of rules and penalties, copies should be posted in each classroom participating in the breakfast program. Other problems we felt might be solved by additional children working on a task or simply by everyone growing more accustomed to the situation.

Before we quit for the day, the Readying Group tallied the amount of cereal, milk, and juice consumed and sent this information to the principal. The Ordering Committee inventoried the stockroom. Their list is shown in Figure C4-1.

1. Cereal 14 cases (48 BOWLS per case)
2. Juice 13 cases + 3 cans 12 in a Pack
3. Gramcrackers 1 cases + 6 24 in a Pack
4. PoPTarTs 1 cases and 4 Packs 100 PoPTarTs in a cases
5 11 Gramcrackers in a Pack 25 Pack

Figure C4-1

We had another evaluation period after breakfast the next day. The children were pleased that they had cut eleven minutes off the total time for preparation, serving, and clean-up. The problems on this day resembled those from the previous session. On the whole, there were fewer problems and most of the minor ones seemed easy to solve.

The children kept track of food consumed each day by noting how much of each item was put out and how much remained at the end of the day. The cereal record for the second day is shown in Figure C4-2, and the milk record for

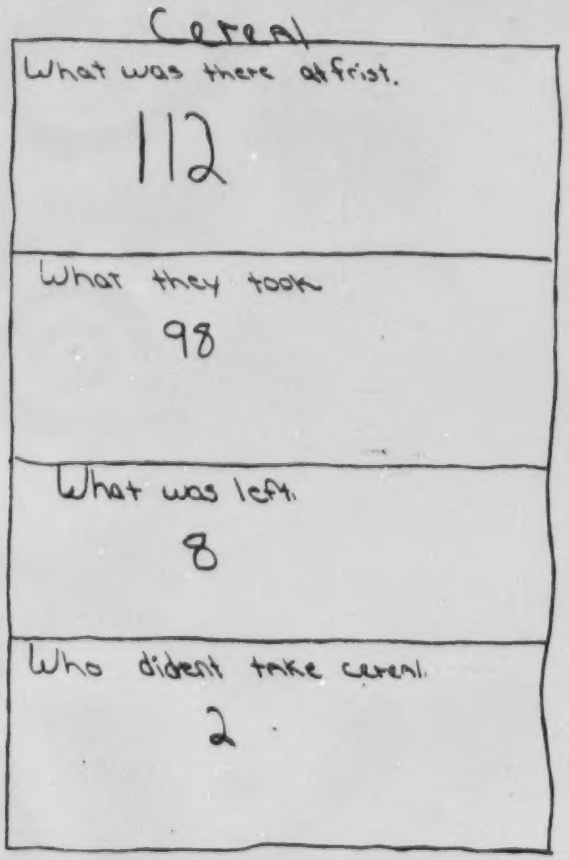


Figure C4-2

the third day is shown in Figure C4-3.*

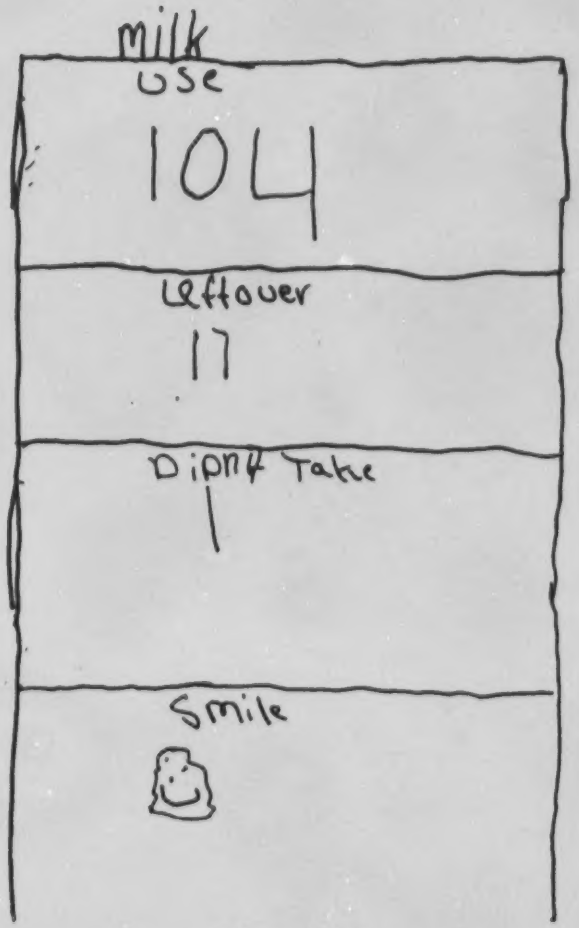


Figure C4-3

The following week, the class was given another breakfast problem to solve. The kindergarten children were not

*The children might keep these records and later check to see whether variations in usage were due to frequency of serving certain cereals or juices, certain combinations of juice and cereal, or day of the week.--ED.

participating in the program in the basement but were receiving food in their own room. The aide had been lugging food upstairs for both the morning and afternoon sessions. Often the kindergarten ended up with sour milk and odd lots of food. A great deal of preparation time was needed for opening cereal and milk and pouring juice. The kindergarten teacher asked if we would like to help out.

The desire to volunteer seemed overwhelming. When we had the correct times (8:15 A.M. and 12:15 P.M.) and had found out how many volunteers were needed (two), we had to decide who would be the lucky helpers. Eighteen students wanted the job. Certain qualifications limited the number, however. We decided that only people who could arrive early and were not already working on the breakfast program should be allowed to help. This narrowed the list to nine children. We selected two children and one alternate to help each kindergarten class.

The Ordering Committee began meeting on a regular basis in late October. After working out their plans in group meetings, they presented them to the rest of the class. They wanted to survey the breakfast-eaters each week to find out what foods were preferred. Since no one offered objections, I asked if they would be able to reorder each week. After checking with the office they found out that orders had to be taken about three to four weeks in advance. The next plan was to think up possible selections and to take only one survey. We decided to get back to this later when they had worked out more of the details.

The Ordering Group had also taken a food inventory and decided that there was barely enough food to last the following week. Only two cases and three packages of Sugar Pops, one-half case of Sugar Smacks, two cases of graham crackers, and two cases of Pop-Tarts remained. After reporting these figures to the class, they met with the principal to work out the amounts of food that should be ordered. Much to their surprise, the children were not only allowed to make up the new order but were asked to phone it in to the purchasing and food services department. The principal also suggested that they phone the local branch of the bank and check the balance in the breakfast account. The children were thrilled by this responsibility. When they returned to class, they described their experiences to the rest of us. A copy of their order is shown in Figure C4-4.

During the next several sessions the class made a systematic attempt to identify problems and correct them. This evaluation process continued throughout the school year and

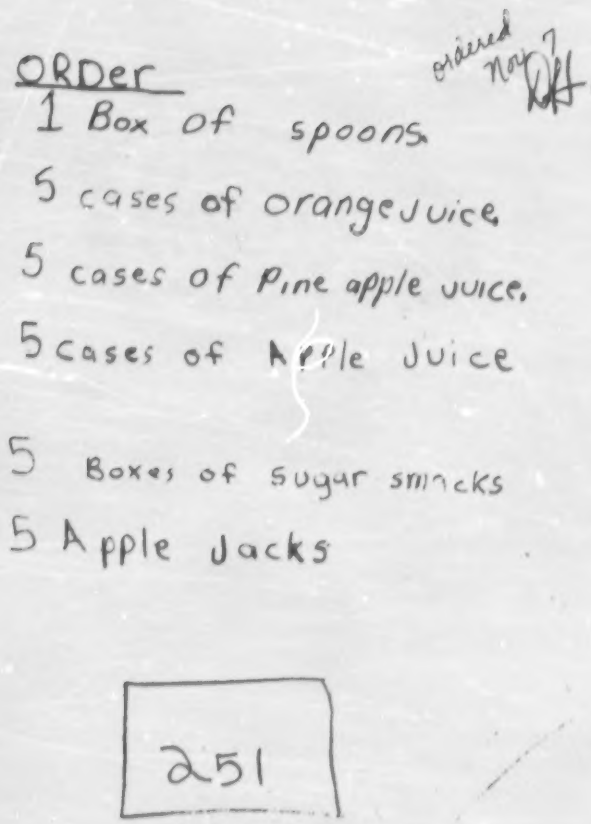


Figure C4-4

1. Everytime we go down there the stuff isn't there.
2. Not enough food
3. sticky tables
4. Milk poppers
5. Waste food
6. Running inthe gym
7. Safetys come in the gym
8. ticket teacers
9. People sneaking extras
10. teachers taking food
11. to much noise in the gym
12. People Fighting in line

Figure C4-5

was important to the successful maintenance of the breakfast program. Sometimes groups spent a whole class session describing problems and receiving suggestions on how to correct them.

The group in charge of getting things ready in the morning complained that the custodian didn't always get the food out of the refrigerator on time in the morning, that the tables were sticky from the night before, and that they were bothered by people snitching food (including teachers). This group had a lot of internal dissension and it took a long time to work out solutions. Finally, we decided on the following policy:

1. Make sure everything is ready the day before. Check on food, milk, juice, cups, spoons, can openers, and tally sheets.

2. Check inventory with the Ordering Committee. (The Ordering Committee volunteered to keep the Readying Committee informed if they, in turn, could be informed of amounts of food consumed daily.)

3. I would be called to chase out safety patrols snitching food if they didn't leave after one warning. (This lasted until a better system of discipline developed.)

The children in the Cleanup Committee insisted that they were scrubbing off the tables at night and therefore they couldn't be sticky. The complaints persisted until the spring, when the janitor informed the group that it didn't matter how much disinfectant they used if the sponge was full of orange juice. After experimenting with several sponges in various stages of being rinsed out, the children agreed that he had a point. From then on the tables were generally cleaner and the Readying Committee's troubles lessened.

The Serving Committee had complaints similar to those of the Readying Committee--discipline problems, spilled and spoiled food, not enough food, etc. A list of gripes from both committees is shown in Figure C4-5. Some of the Serving Group's problems were solved simply by getting more help. One of their biggest complaints--other kids "snitching" food--was eliminated by rearranging the serving line so that desirable items--cookies or Pop-Tarts--were placed near the monitors.

The Ordering Committee was the most resourceful in solving their own problems as well as those of other groups. One recurring problem was that of spoiled milk. The two coolers, dating from 1956 and 1957, were very ineffectual in keeping the milk cold. When breakfast eaters returned a lot of spoiled milk, the servers had to go back into the refrigerator for more; meanwhile, students grabbed cookies from the unattended line. Much milk was wasted, and the children often ran out. To solve this problem, the children in the Ordering Committee persuaded the school administration to buy a new cooler which kept the milk much better than the previous ones.

The Ordering Committee had the intricate task of figuring out how much food to order. They developed a method using the numbers of people who had eaten breakfast during the previous week (since breakfast orders were taken weekly by the teachers). The children called their estimate the Participation Projection Ratio and used the following formula for determining it:

Participation Projection Ratio =

Number of free breakfasts served (standard)
+ 3 (estimated number of new participants)
- 1 (estimated number of dropouts from program)
+ Number of paying eaters (usually 20)
+ Number of partially paying eaters
(not stable; 25 in total but they figured that only about 12 actually ate.)

Although they added extra food in case of wastage, the children were usually low in their estimates. They often forgot to include themselves, as they usually ate breakfast in return for helping out. Some of the children continued to snitch extra food, which also led to shortages. This problem continued to the end but was still less serious than before the children began running the program.

One day the children who were setting up found that the cereal had arrived in three-ounce old fashioned cereal boxes with perforations in the cardboard instead of the usual seven-ounce cereal bowls with tear-off foil lids. They informed the Ordering Committee, which went to the gym to see what was happening. Here is what the children observed:

1. Most of the kids don't know how to open these packages.

2. The wax paper inside usually rips apart and the milk gets all over.

3. There's more milk than there is cereal, so it overflows.

4. Everybody got mad.

5. Everything was a mess.

After meeting with the administration, the children checked the rest of the order. They discovered that all the cereal was in the same type of packages. The Ordering Committee called Purchasing and received a promise that it would be picked up and replaced. Then the children carried it to the delivery door where it was picked up by 3:00 P.M. the same day. New cereal was delivered the following day. To compensate for the time lag, Pop-Tarts were served the next morning.

Because they had so many other tasks to do, the children in the Ordering Group asked the Serving Group to survey the breakfast eaters in order to find out which foods were preferred. The Serving Group began by observing which juices were the most popular. Ordinarily, one type of juice was served for a whole week. The children requested that the five kinds of juices--apple, orange, pineapple, grapefruit, and pear nectar be served on successive days during one week so that they could count the number of children that took each kind. (The unpopular tangerine and tomato juices had already been eliminated from the menu.) Each day, when the juice was served, the children counted how many children took it. They discovered that very few people took grapefruit juice or pear nectar, whereas many people took orange, apple, or pineapple juice. Later, the children handed out written preference surveys to the breakfast eaters while they were being served, asking them to check their favorite kind of juice. They found apple juice to be the most popular; orange and pineapple were about equal in popularity. The children decided to ask the Ordering Committee to order only these three juices and to order more apple juice than orange or pineapple.*

The Serving Committee also sent around a preference survey for Pop-Tarts. They discovered from the results that

*The children might draw a bar graph of the results of the survey.--ED.

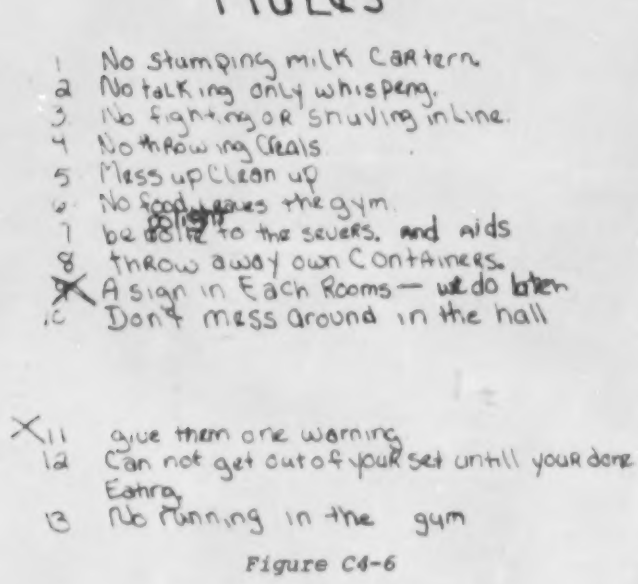

Rules
1 No stumping milk Cartern
2 No talking only whisperg.
3 No fighting OR shuving in line.
4 No throwing Cealis
5 Mess up Clean up
6 No food leaves the gym.
7 be polite to the severs. and aids
8 throw away own Containers.
A sign in Each Rooms — we do later
10 Dont mess around in the hall
11 give them one warning
12 Can not get out of your set until your done Eating
13 No Running in the gym

Figure C4-6

chocolate Pop-Tarts were the most popular; strawberry and blueberry were also popular whereas cinnamon ones were universally disliked. Later in the year, however, the children decided to try two new flavors: vanilla and Dutch apple. Much to their surprise, they found that these two flavors were at least as popular as chocolate, and they continued to serve all five.

Since discipline continued to be a problem, the children decided to establish an Ad Hoc Rules Committee to make up rules for student behavior. The committee developed seventeen rules and presented them to the class, but the rest of the children wanted the list narrowed because "there are too many rules anyway." The children revised this list several times (see Figure C4-6 for one revision), but each time the class felt it could be more concise. Here is an account of one conversation:

"I hate that dumb one about no talking."

"Yeah, everybody has to talk."

"Well, the Serving Group said to make a rule about noise, so we did," a committee member replied.

"Can you find any rules that mean about the same thing?" I asked.

"Pushing, shoving, being good in the halls, and not running around in the gym."

"Can't you change throwing cereal and messing up and throwing away your containers into one rule?" someone else asked.

The final revision had seven rules. An eighth rule requested students to obey the rules and a ninth rule stated the punishment that the children had received permission to give: after one warning an unruly student would receive a demerit card against him/her.

The children posted the rules in the participating classrooms and the gym. The Rules Committee developed a skit for the primary grades that explained each rule by showing the wrong way to do something followed by a demonstration of the right way. For example, they vigorously stomped on milk cartons (the wrong way to dispose of them), and then put milk cartons carefully in the wastebasket (the right way). Some of the children may have felt that the wrong way looked like more fun, but they were impressed by the possibility of punishment. The group was reluctant to perform the skit for other grades, as they felt it might seem too juvenile for their peers.

The children discussed how the rules could be enforced in the breakfast room and developed a new committee in charge

of discipline. The committee was abolished, however; publicizing the rules and better monitoring of the breakfast line greatly improved behavior, and the class felt that discipline was no longer necessary.

Before Christmas, we held an evaluation of the work we'd done so far. The children were basically pleased with the program for the following reasons:

1. Mr. Henderson (principal) is happy with it.
2. We got rid of most of the "yuckiest" stuff (tangerine juice, tomato juice).
3. We got a new cooler.
4. The Community Involvement Committee wrote us up and said we're doing a fine job.
5. We don't have as much waste as we used to have.
6. There is better service from the food companies.
7. Most of the committee people do good work.
8. We solved most of the problems we used to have, like sour milk, stealing, and ticket teasing.
9. Breakfast is shorter than it used to be.
10. The kids who eat down there seem to be acting better.
11. We run it without any teachers or the principal helping.

The only criticisms were offered by a new girl, who said that she had studied nutrition in her old school and knew that cereals made with sugar were bad for you. She challenged the children to do something about the nutritional aspects of the breakfast program.

After Christmas, while I was out on sick leave, the children called in the Public Health Nurse and asked her about the nutritional value of the breakfasts. She told them that the government regulations on the breakfast program required a certain amount of calories, not vitamins, and that the sugared cereals and cereal substitutes met these requirements. She admitted that the breakfasts could be better but told the children that nothing could be done about it. The children were greatly disappointed. At this point, some of the children who were receiving free breakfasts in return for helping with the program decided to start eating at home again so they could be sure of getting nutritious food.

The children also met with failure when they tried to get hot breakfasts during the cold month of January. They were told by the administration that Food Services could not handle 147 hot breakfasts and that the school (which had no

cafeteria) could not keep that much food warm for over an hour. The children were discouraged. However, warmer weather in February made hot food less important to the breakfast eaters.

One day in late January members from the Serving Group brought up a returned Pop-Tart that had a large plastic tape, hair, and white and dark hard nodules in it. They told the class that children often returned Pop-Tarts with hair or hard pieces in them, but they felt that this one was the worst. We discussed the consumer research angle, and the children decided to write the cereal factory and enclose the Pop-Tart. Two of the children wrote letters. The first was a letter of general complaint, including the following comments:

1. many poorly packaged cereal packs
2. Pop-Tarts often had hair and "hard things" in them
3. suggestions for better food preparation
   a. wash hands
   b. wear hairnets
   c. make sure aprons are clean
   d. make sure equipment is clean

The second letter was to include the Pop-Tart, but it was lost (and presumed eaten) at this time. The student sent the letter without Exhibit A. At this time I went on a health leave, and a month elapsed with no word from the cereal factory. In March, the student who had sent the first letter reminded the class that we hadn't received an answer. A class letter was sent immediately, but still no answer came.

At the end of April my class went on a joint camping trip with another class. During our stay at the camp we decided to pay a visit to the factory that made cereal and Pop-Tarts. The tours were highly structured and the guide obviously told us the same things as other groups. A group of five children from my class who had appointed themselves spokespersons for the group requested to see the manager about our cereal and Pop-Tart complaints. The children were at first told that the tour didn't include this, but when I told the tour guide about our letters and lack of response, we were told that the shipping supervisor was not available but that we could talk to a representative.

At the end of the tour, three members of the committee and several members of the other class were in my group, who

interviewed the representative. The children first asked why our letters had not been answered and were told that the company received a large volume of mail and that the letter had probably been overlooked by accident. The children asked several questions about the things they had seen on the tour. Then someone mentioned the Pop-Tarts with the hair and dirt in them. He responded that the factory was inspected constantly for violations of health and safety measures by federal inspectors and that they had always received an excellent rating; in fact, it was because their factory was so clean that they could give us tours without endangering the product.

Since he hadn't focused his answer on the question, I asked him directly why the Pop-Tart had dirt in it. He explained that government guidelines allowed for a certain percentage of rodent hair, human hair, and other extraneous materials and that their product contained far less than the amount permitted. However, he said, there were always a few products that escaped the company's inspection teams.

One child mentioned that we had seen two defective bowls of cereal packaged for institutions go past the inspection point on our tour of the factory. The company representative replied that we had observed only one of many checkpoints.

Then one child asked if the commercial products sold on shelves were treated with more care than the packages that were sent to institutions. The representative said, "Of course not." The children completed the session by asking other questions not related to the unit.

The net result of the visit to the cereal factory was that the children felt that they had had a good dialogue about consumer products. They all accepted their six-packs of cereal and considered the time very well spent.

The breakfast program continued to function well throughout the rest of the year. The children sometimes changed jobs and added new members or dropped unproductive ones, but they were basically happy with the committees as they existed and decided against a major task switch. The only complaint was that other children did not get to help the kindergarten class with breakfast; the kindergarten teacher had requested that the same children continue to help because they were doing a good job.

In January, when I was out on sick leave, an evaluator from Chicago, came to visit. She was so impressed with the breakfast program that she suggested that the Allen Street School become the prototype of the federally-funded break-

fast programs for Lansing. We found out that our school had been selected for the following reasons:

1. We had a poor physical plant.
2. We provided adequate food units (based on calories, not nutrients).
3. We had the least amount of waste and enthusiastic participation.
4. The program was totally operated by students.

The evaluator's report was received by the Detroit Legal Services and, with no warning, four people arrived on March 9 from Detroit to make a movie of our program. The movie was to be shown in Detroit and used as a guide for setting up breakfast programs in that city. The film consisted of interviews with students who were eating, students who helped on the breakfast committees, the principal, myself, and the kindergarten teacher who was receiving USMES help.

After the film crew left, the children were walking on air. They realized that they had spent several months trying to improve eating in school and found themselves repeatedly falling short of their goals. We now saw that we had created the best program of those evaluated in the Lansing area. We had, in fact, been competing with ourselves.

D. References

1. LIST OF "HOW TO" CARDS

Below are listed the current "How To" Card titles that students working on the Eating in School challenge may find useful. A complete listing of both the "How To" Cards and the Design Lab "How To" Cards is contained in the USMES Guide. In addition, the Design Lab Manual contains the list of Design Lab "How To" Cards.

GRAPHING

GR 1 How to Make a Bar Graph Picture of Your Data
GR 2 How to Show the Differences in Many Measurements of the Same Thing by Making a Histogram
GR 5 How to Find Out If There is Any Relationship Between Two Things by Making a Scatter Graph
GR 7 How to Show Several Sets of Data on One Graph

MEASUREMENT

M 1 How to Use a Stopwatch
M 2 How to Measure Distances
M 9 How to Make a Conversion Graph to Use in Changing Measurements from One Unit to Another Unit
M 10 How to Use a Conversion Graph to Change *Any* Measurement in One Unit to Another Unit

PROBABILITY AND STATISTICS

PS 2 How to Record Data by Tallying
PS 3 How to Describe Your Set of Data by Finding the Average
PS 4 How to Describe Your Set of Data by Using the Middle Piece (Median)
PS 5 How to Find the Median of a Set of Data from a Histogram

RATIOS, PROPORTIONS, AND SCALING

R 1 How to Compare Fractions or Ratios by Making a Triangle Diagram*
R 2 How to Make a Drawing to Scale
R 3 How to Make Scale Drawings Bigger or Smaller

*Now called Slope Diagram.

New titles to be added:

How to Round Off Data
How to Compare Two Sets of Data by Making a Q-Q Graph
How to Design and Analyze a Survey
How to Choose a Sample
How to Compare Two Sets of Data by Using Interquartile Ranges
How to Make and Use a Cumulative Distribution Graph
How to Measure Sound Intensity

A cartoon-style set of "How To" Cards for primary grades is being developed from the present complete set. In most cases titles are different and contents have been rearranged among the various titles. It is planned that this additional set will be available early in 1977.

2. LIST OF BACKGROUND PAPERS

As students work on USMES challenges, teachers may need background information that is not readily accessible elsewhere. The Background Papers fulfill this need and often include descriptions of activities and investigations that students might carry out.

Below are listed titles of current Background Papers that teachers may find pertinent to Eating in School. The papers are grouped in the categories shown, but in some cases the categories overlap. For example, some papers about graphing also deal with probability and statistics.

The Background Papers are being revised, reorganized, and rewritten. As a result, many of the titles will change.

DESIGN PROBLEMS

DP 13 People and Space by Gorman Gilbert

GRAPHING

GR 2 Notes on Data Handling by Percy Pierre
GR 3 Using Graphs to Understand Data by Earle Lomon
GR 4 Representing Several Sets of Data on One Graph by Betty Beck
GR 6 Using Scatter Graphs to Spot Trends by Earle Lomon
GR 7 Data Gathering and Generating Graphs at the Same Time (or Stack 'Em and Graph 'Em at One Fell Swoop!) by Edward Liddle

GROUP DYNAMICS

GD 2 A Voting Procedure Comparison That May Arise in USMES Activities by Earle Lomon

PROBABILITY AND STATISTICS

PS 4 Design of Surveys and Samples by Susan J. Devlin and Anne E. Freeny
PS 5 Examining One and Two Sets of Data Part I: A General Strategy and One-Sample Methods by Lorraine Denby and James Landwehr
PS 6 Examining One and Two Sets of Data Part II: A Graphical Method for Comparing Two Samples by Lorraine Denby and James Landwehr

RATIOS, PROPORTIONS, AND SCALING

R 1 Graphic Comparison of Fractions by Merrill Goldberg
R 2 Geometric Comparison of Ratios by Earle Lomon
R 3 Making and Using a Scale Drawing by Earle Lomon

3. BIBLIOGRAPHY OF NON-USMES MATERIALS

The following are references that may be of use in teaching Eating in School. A list of references on general mathematics and science topics can be found in the USMES Guide. (Publisher's prices, where listed, may have changed.)

Resource Books for Teachers

Association for Childhood Education International, *Cooking and Eating with Children--A Way to Learn*. 3615 Wisconsin Ave., N.W., Washington, D.C. 20016

Stresses need for healthy food and gives recipes and suggestions for involving children.

Biological Sciences Curriculum Study (BSCS). *Investigating Your Environment*--Student Handbook.

Contains section on noise and how it may be measured. Explanations useful for teachers and older students.

Brandwein, Paul F., et. al. *Concepts in Science*. Teacher's Guide Number 4. Harcourt Brace Jovanovich, Inc., Chicago, Illinois 1975.

First unit, "The Bounce of Sound," useful for teachers when children's challenge relates to noise in the lunch room. Description of sound concepts and ideas about sound proofing.

Callahan, Dorothy L., ed. *Focus on Nutrition: Teacher's Handbook for Nutrition Education, K-6*. Massachusetts Department of Education, Bureau of Nutrition Education, School Food Services, 182 Tremont St., Boston, MA.

Write to the address listed for information on this book. There is also a volume for Grades 6-12.

Group for Environmental Education, Inc. *Yellow Pages of Learning Resources*. 1214 Arch St., Philadelphia, PA 19107. 1972.

Contains descriptions of places such as a bakery, butcher's, food distribution center, and restaurant that might be interesting to classes studying food acquisition and preparation.

Health and Growth Program. Scott Foresman & Co., 1900 East Lake Ave., Glenview, IL 60025.

Unit on nutrition specially applicable. Program directed towards teaching about physical and mental health of people.

Society for Nutrition Education. *Audiovisuals for Nutritional Education*. Write to SNE at 2140 Shattuck Ave., Suite 1110, Berkeley, CA 94704.

Contains selected reviews of audiovisual materials from Journal of Nutrition Education.

Resource Books for Children

Bayles, Frances. *You Can Make Good Things to Eat*. Children's Press, 1975. ($4.50).

Easy-to-make recipes, many developed by second-graders. Most of these don't require cooking and could be made as snacks in the classroom.

Center for Science in the Public Interest, 1779 Church St., N.W., Washington, D.C. 20036.

Nutritional Scoreboard. An in-depth discussion of nutrition and disease, suitable for older children. ($2.50).

Food Scorecard. An adaptation of above book for 9-12 year-olds. Sold only in bulk. (20-99 copies, 35¢ each.)

Creative Food Experiences for Children. Games and recipes that enliven food and nutrition study. ($4.00).

Cooper, Terry T. and Marilyn Ratner. *Many Hands Cooking: An International Cookbook for Girls and Boys*. Thomas Y. Crowell Co., Children's Books, Dept. SS., 555 5th Ave., N.Y., N.Y. 10019. ($4.46).

Forty recipes from all over the world. Contains section on nutrition, safety, explanations and comparisons of measurements, and world map. Suitable for intermediate children.

Paul, Aileen. *Kids Cooking Without a Stove*. Doubleday & Co., 245 Park Ave., N.Y., N.Y. 10017 ($4.46).

Contains 31 recipes of foods for meals and snacks. Suitable for older primaries and intermediates.

Other books for children about cooking:

Cobb, Vicki. *Arts and Crafts You Can Eat*. J. B. Lippincott Co., Phila, N.Y.C. ($1.95).

Parents' Nursery School. *Kids Are Natural Cooks*. Houghton Mifflin Co., Boston, MA 1974 ($3.95).

Porter, Susan. *Classroom Cooking: A Basic Guidebook*. Order from: Children's Museum, The Jamaica Way, Jamaica Plain, MA 02130. ($1.25).

Audiovisual Materials

The Food Game/A Consumer Viewpoint. Sunburst Communications, Pound Ridge, N.Y. 10576. ($22.50 each.)

Two films on nutrition vs. taste controversy. First has a quiz show format and points out nutritional value of foods. Second looks at nutritionally poor diets.

You--And Your Food (16 mm film). Walt Disney Educational Media Co., 800 Sonora Ave., Glendale, CA 91201 ($130). Shows diets of animals and explains importance of a balanced diet. 8 min.

Places to write to for more information about food and nutrition:

Center for Science in the Public Interest, 1779 Church St., N.W., Washington, D.C. 20036

SCPI has a Nutrition Action Project which can provide teachers with reliable information on nutrition. Ask for a free publication list.

DuPont Company, Graphics Center, A-16006, Wilmington, DE 19898.

Write for poster showing what a family eats, where food comes from, etc.

Food and Nutrition Information and Educational Materials Center, National Agricultural Library, Room 304, Beltsville, MD 20705.

Write to this agency for information about educational resources on nutrition.

National Nutrition Education Clearing House, Society for Nutrition Education 2140 Shattuck Ave., Suite 1110, Berkeley, CA 94704.

Write for lists of teaching materials and reliable references on nutrition and nutrition education.

Federal standards for school lunches are available from the Department of Health, Education and Welfare in Washington, D.C.

4. GLOSSARY

The following definitions may be helpful to a teacher whose class is investigating an Eating in School challenge. Some of the words are included to give the teacher an understanding of technical terms; others are included because they are commonly used throughout the resource book.

These terms may be used when they are appropriate for the children's work. For example, a teacher may tell the children that when they conduct surveys, they are collecting *data*. It is not necessary for the teacher or students to learn the definitions nor to use all of the terms while working on their challenge. Rather, the children will begin to use the words and understand the meanings as they become involved in their investigations.

Accounts Payable	A current liability representing obligations to pay a creditor, usually a supplier.
Accounts Receivable	A current asset representing obligations owed to a company, usually by its customers.
Asset	Anything owned that is measurable in terms of money.
Audio	Relating to the transmission, reception, or reproduction of sound.
Audiovisual	Relating to both hearing and sight.
Average	The numerical value obtained by dividing the sum of the elements of a set of data by the number of elements in that set. Also called the mean.
Bias	A deviation in the expected values of a set of data, often occurring when some factor produces one outcome more frequently than others.
Bookkeeping	A system for recording business transactions.
Calibration	Setting and marking an instrument to correspond to standard measurements.

Calorie	A unit expressing the energy content of food. Food with a value of one Calorie would when digested in the body, produce an amount of energy whose heat equivalent would raise the temperature of one kilogram of water one degree centigrade. Technically, this unit is called the *kilogram-calorie* or *kilo-calorie*; it is 1000 times larger than the ordinary calorie of physics. (It is also written with a C to distinguish it from the regular or small calorie.
Carbohydrates	A major class of organic nutrients (e.g., sugars, starches, cellulose) used by the body as energy sources. They are formed naturally only by green plants and may be converted into other carbohydrates by animals. They are broken down into simple sugars during digestion and may also be stored in the body as complex starches (usually, glycogen).
Comparative Shopping	A method for determining the best buy(s) by comparing the costs, quantities, and qualities of different brands of products.
Complement of a Set	See *Set*.
Consumer	A person who buys or uses goods or services.
Conversion	A change from one form to another. Generally associated in mathematics and science with the change from one unit of measure to another or the change from one form of energy to another.
Correlation	A relation between two sets of data.
Cost	The amount of money needed to produce or to purchase goods or services.
Cost Accounting	That form of accounting designed to provide management with cost information.
Data	Any facts, quantitative information, or statistics.
Decibel	A unit of measurement of sound intensity. The number of decibels is equal to ten times the logarithm of the ratio of the sound intensity and a standard reference point. The reference point is the power required to produce a barely audible sound at a frequency of 1000 Hertz (i.e., a pitch nearly two octaves above middle C).

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Decibel (cont.)

Relative Intensities of Sounds

	in decibels	In microwatts/cm^2
threshold of hearing	0	10^{-10}
rustling leaves	20	10^{-8}
talking (at 3 ft.)	40	10^{-6}
noisy office or store	60	10^{-4}
subway car	100	1
threshold of pain	120	100

Degree — A unit of measurement of temperature or angle.

Digestion — The process of breaking down food substances within the body into other substances small enough to pass through cell membranes.

Discount — A reduction in the price of products or services, often stated as a percentage of price. This is done (1) for customers who buy in large quantities or (2) in order to generace a greater volume of sales.

Distribution — The spread of data over the range of possible results.

Economics — A social science concerned chiefly with description and analysis of the production, distribution, and consumption of goods and services.

Event — A happening; an occurrence; something that takes place. Example: a teacher or a student cutting in the lunch line.

Fats — A major class of organic nutrients used principally by the body for storage of energy. They have almost twice the calorie content of other nutrients and are more difficult to digest. Animal and vegetable oils contain fats.

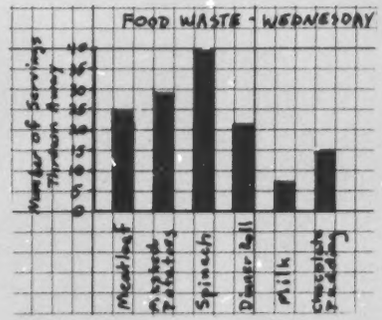
Frequency — The number of times a certain event occurs in a given unit of time or in a given total number of events.

Graph — A drawing or a picture of one or several sets of data.

Bar Graph

A graph of a set of measures or counts whose sizes are represented by the vertical (or horizontal) lengths of bars of equal widths or lines. Example: the number of servings of different items on a day's menu that are thrown away.

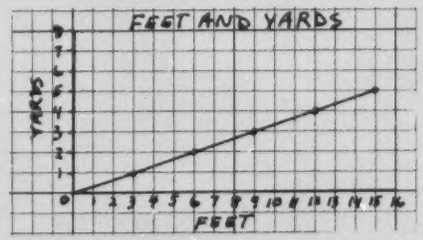
Food Items	No. Servings Thrown Away
Meatloaf	24
Mashed Potatoes	28
Spinach	39
Dinner Roll	21
Milk	7
Chocolate Pudding	14



Conversion Graph

A line graph that is used to change one unit of measurement to another. For example, changing feet to yards or vice versa.

Yards	Feet
1	3
2	6
3	9
4	12
5	15



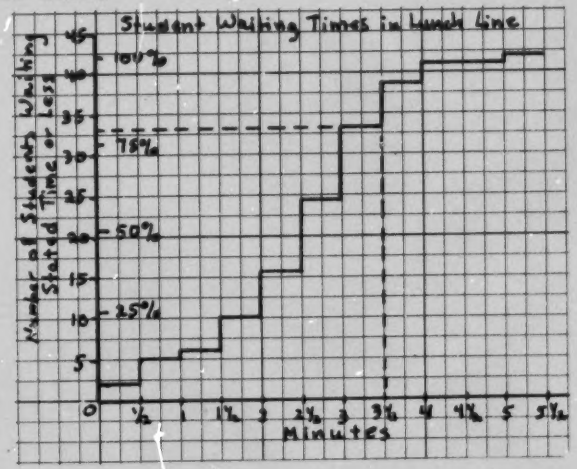
Cumulative Distribution Graph

A graph that can be constructed from a histogram by computing running totals from the histogram data. The first running total is the first value in the histogram data (see table of values). The second running total is the sum of the first and second values of the histogram, the third is the sum of the first, second, and third values, and so on. The horizontal scale on the graph is similar to that of the histogram; the vertical scale goes from 0 to the total number of events observed or samples taken (in the example, the total number of students who were timed going through the lunch line. Each vertical distance on the graph shows the

Cumulative Distribution Graph (cont.)

running total for the value shown on the horizontal scale; thus the graph below indicates that thirty-three students (or 79% of the students) have a waiting time of three and one-half minutes or less.

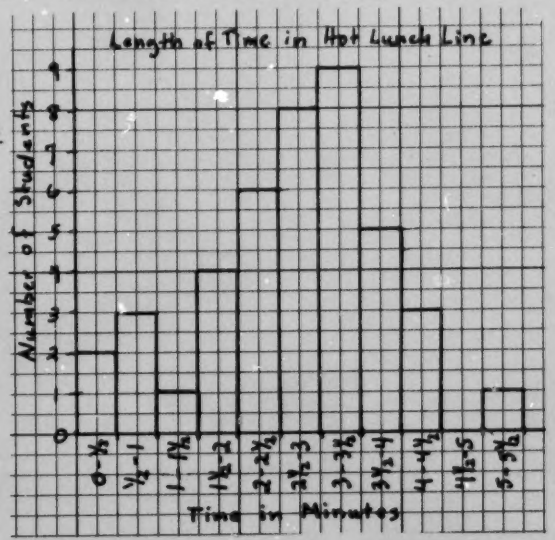
Time (min.)	Running Totals
½ or fewer	2
1 or fewer	5
1½ or fewer	6
2 or fewer	10
2½ or fewer	16
3 or fewer	24
3½ or fewer	33
4 or fewer	38
4½ or fewer	41
5 or fewer	41
5½ or fewer	42



Histogram

A type of bar graph that shows the distribution of the number of times that different measures or counts of the same event have occurred. A histogram always shows numerical data on the horizontal axis. Example: the number of students who went through the lunch line in different amounts of time (rounded off to the nearest half minute).

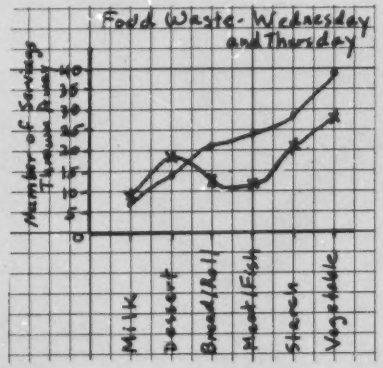
Time Waited in Line (min.)	Number of Students
½	2
1	3
1½	1
2	4
2½	6
3	8
3½	9
4	5
4½	3
5	0
5½	1



Line Chart

A bar graph that is represented by circles, triangles, or crosses with lines connecting them so that it has the appearance of a line graph. (See *Line Graph*.) This is a useful representation when two or more sets of data are shown on the same graph. Example: the number of servings of comparable items on the menu that are thrown away on Wednesday and on Thursday.

Food Items	No. Servings Thrown Away Wednesday	Thursday
Milk	7	9
Dessert	14	18
Bread or Roll	21	13
Meat/Fish	24	12
Starch	28	21
Vegetable	39	28



Line Graph

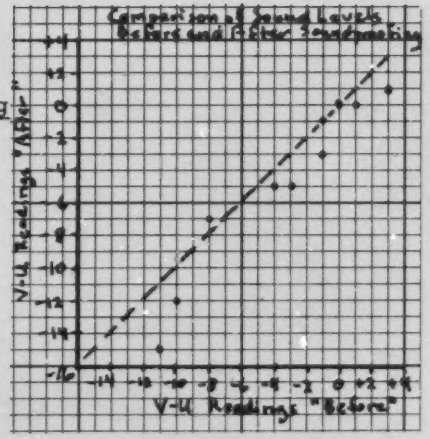
A graph in which a smooth line or line segments pass through or near points representing members of a set of data. Since the line represents an infinity of points, the variable on the horizontal axis must be continuous. If the spaces between the markings on the horizontal axis have no meaning, then the graph is not a line graph, but a line chart (see *Line Chart)*.

Q-Q Graph

A graph that shows the comparison between the same type of data collected from two groups of people or from two different situations. Example: sound level readings (taken with a VU-meter on a tape recorder) before and after soundproofing the lunchroom. The data for each set is ordered and the smallest measurement of one set plotted against the smallest of the other set, the second smallest against the second smallest, etc. The scatter of points is compared to a reference line, a dashed 45° line that represents data from two identical sets.

Q-Q Graph (cont.)

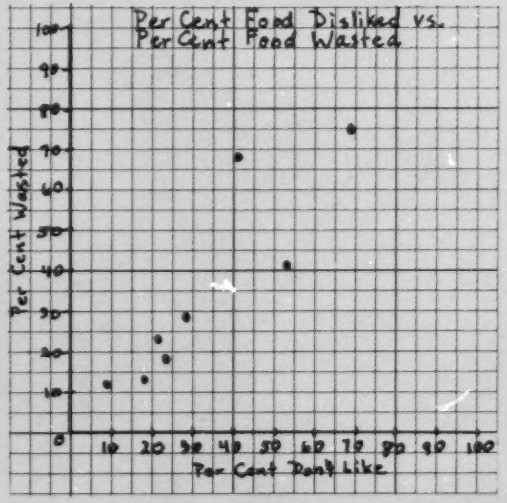
VU-Meter Readings Before Soundproofing	VU-Meter Readings After Soundproofing
-11	-15
-10	-12
- 8	- 7
- 4	- 5
- 3	- 5
- 1	- 3
- 1	- 1
0	0
+ 1	0
+ 3	+ 1



Scatter Graph

A graph showing a scatter of points, each of which represents two characteristics of the same thing. For example, in the graph below, the position of each point indicates percentage of students disliking a particular food vs. the percentage wasted.

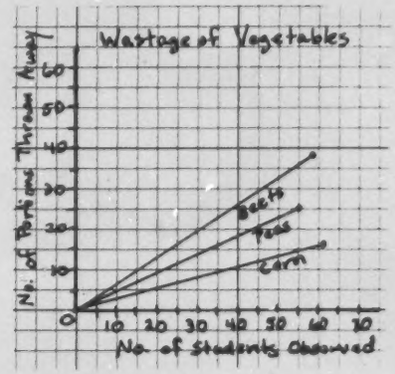
Food	% Students Not Liking	% Portions Wasted
Ice Cream	9%	12%
Hamburger	18%	13%
Pizza	21%	23%
Chocolate Pudding	23%	18%
Corn	28%	29%
Peas	41%	68%
Tuna Casserole	53%	41%
Broccoli	69%	75%



*Slope Diagram**

A graphical means of comparing fractions or ratios. To represent the ratio a/b, plot the point (b,a) and draw a line from (b,a) to the origin, (0,0). The slope of this line represents the ratio a/b. By comparing slopes of different lines, different ratios can be compared; the steeper the line the larger the ratio. For example, in the diagram below showing the ratio of servings of vegetables thrown away to the total number served, the ratio of servings of corn thrown away to the number served is the lowest. Therefore, serving corn creates less waste than the other vegetables listed.

Vegetable	No. Portions Thrown Away	No. Students Observed
Corn	16	61
Peas	25	55
Beets	38	59



Histogram

See *Graph*.

Hypothesis

A tentative conclusion made in order to test its implications or consequences.

Inference

An assumption derived from facts or information considered to be valid and accurate.

Inorganic

A term used to describe something that is not or was not part of a living animal. Foods naturally contain some inorganic substances, such as minerals. Many foods also contain some inorganic substances added by man, such as pesticide residues or preservatives.

Intersection of Sets

See *Set*.

Inventory

The quantity of goods or materials on hand.

*Formerly called Triangle Diagram.

Liability	A debt or obligation.
Mapping	Assigning each element in one set of data to a corresponding element in another set.
Marketing	The study or implementation of the most profitable and efficient methods of directing goods from manufacturer to consumer.
Market Research	The compilation of statistical information concerning consumers or purchasers.
Matrix	A chart of data arranged in rows and columns.
Mean	See *Average*.
Median	The middle value of a set of data in which the elements have been ordered from smallest to largest. The median value has as many elements above it as below it.
Metabolism	The process by which an organism transforms food to energy and waste.
Mineral	Nutritionally, a simple, inorganic chemical that animals need in small quantities for body structure or chemical processes within the body. Minerals are found in food substances. Examples of minerals necessary to humans are calcium, magnesium, phosphorus, and iron.
Mode	The element or elements in a set of data that occur most often.
Natural Foods	A term generally used to describe foods that are grown, processed, and marketed without the use of synthetic chemical fertilizers, pesticides, preservatives, or other additives.
Nutrient	Any chemical substance (found in food or soil) necessary for an organism's life and growth.
Nutrition	The process of taking food material into a living organism and converting it into nutrients used for growth, repair, and energy.
Omnivore	An animal that feeds on both plants and animals. Human beings are omnivores.

Ordered Set — A set of data arranged from smallest to largest.

Organic — A term used to describe something that is or was part of a living animal. All foods contain some organic substances (such as animal flesh or plant fibers). See *Natural Foods*.

Organism — A living entity. Example: a human being.

Per Cent — Literally per hundred. A ratio in which the denominator is always 100, e.g., 72 percent = 72/100 = 0.72 = 72% , where the symbol % represents 1/100.

Percentage — A part of a whole expressed in hundredths.

Population — Any group of objects (e.g., people) or events from which samples are taken for statistical measurement.

Probability — The likelihood or chance (expressed numerically) of one event occurring out of several possible events.

Proportion — A statement of equality of two ratios, i.e., the first term divided by the second term equals the third term divided by the fourth term, e.g., 5/10 = 1/2. Also a synonym for ratio: when two quantities are in direct proportion, their ratios are the same.

Proteins — A major class of complex organic nutrients composed of nitrogen-containing building blocks that are called *amino acids*. The body either uses the amino acids from protein directly or synthesizes other amino acids from those in the protein. Although both plants and animals form proteins, animal foods contain more of the proteins essential to humans than do plant foods.

Quartile

First — The first quartile is the value of the quarter-way piece of data in an ordered set of data.

Third — The third quartile is the value of the three-quarter-way piece of data in an ordered set of data.

Interquartile — The range or length of the middle 50% of an ordered set of data; the difference between the first and third quartile.

Range — The difference between the smallest and the largest values in a set of data.

Rank — To order the members of a set according to some criterion, such as size or importance. Example: to put pieces of data from smallest to largest.

Ratio — The quotient of two denominate numbers or values indicating the relationship in quantity, size, or amount between two different things. For example, the ratio of the number of children who can use a lunchroom table to the area occupied by the table might be 16 children/4½ square meters or 16 children:4½ square meters.

Retail Price — The price level of goods sold in small quantity to the consumer.

Sample — A representative fraction of a population studied to gain information about the whole population.

Sample Size — The number of elements in a sample.

Scale — A direct proportion between two sets of dimensions (as between the dimensions in a drawing of a lab and the actual lab).

Scale Drawing — A drawing whose dimensions are in direct proportion to the object drawn.

Scale Model — A three-dimensional representation constructed to scale.

Set — A collection of characteristics, persons, or objects. Each thing in a set is called a member or an element.

Set Theory — The branch of mathematics that deals with the nature and relations of sets.

Intersection of Sets — The set of elements common to two or more sets. For example, if set A is meat, fish, and cheese foods and set B is starchy foods, casseroles form the intersection of set A and set B.

Universal Set — A set that contains all elements relevant to a particular problem.

Venn Diagram — A drawing used to illustrate the relationship between sets.

Slope Diagram — See *Graph*.

Sound Intensity	Level or loudness of a sound. A measure of how much sound energy flows through a given area in a given time. Measured in decibels or watts/cm^2.
Sound Level Meter	An instrument used to measure sound intensity.
Statistics	The science of drawing conclusions or making predictions using a collection of quantitative data.
Tally	A visible record used to keep a count of some set of data, especially a record of the number of times one or more events occur. Example: a count of the number of students throwing away a particular type of food served at lunch.
Temperature	A measure of hotness or coldness. Technically, an indication of the average kinetic energy of molecules. Temperature is commonly measured in degrees Fahrenheit or degrees centigrade (Celsius).
Thermometer, Centigrade (or Celsius)	A thermometer on which the interval between the normal freezing and boiling points of water is divided into 100 parts or degrees, ranging from $0^{\circ}C$ to $100^{\circ}C$.
Thermometer, Fahrenheit	A thermometer on which the interval between the normal freezing and boiling points of water is divided into 180 parts or degrees, ranging from $32^{\circ}F$ to $212^{\circ}F$.
Video	Relating to the transmission or reception of the television image.
Videotape	A magnetic tape used to record a television production.
Vitamin	A complex organic substance that an animal usually cannot make internally but that is necessary in small quantities for chemical processes within the body. A human being's diet must include Vitamin A, the B complex, and Vitamins C. D, E, and K. (All occur naturally in food substances.)
Wholesale Price	The price level of goods sold in large quantity to a merchant for resale.

E. Skills, Processes, and Areas of Study Utilized in Eating in School

The unique aspect of USMES is the degree to which it provides experience in the process of solving real problems. Many would agree that this aspect of learning is so important as to deserve a regular place in the school program even if it means decreasing to some extent the time spent in other important areas. Fortunately, real problem solving is also an effective way of learning many of the skills, processes, and concepts in a wide range of school subjects.

On the following pages are five charts and an extensive, illustrative list of skills, processes, and areas of study that are utilized in USMES. The charts rate Eating in School according to its potential for learning in various categories of each of five subject areas--real problem solving, mathematics, science, social science, and language arts. The rating system is based on the amount that each skill, process, or area of study within the subject areas is used--extensive (1), moderate (2), some (3), little or no use (-). (The USMES Guide contains a chart that rates all USMES units in a similar way.)

The chart for real problem solving presents the many aspects of the problem-solving process that students generally use while working on an USMES challenge. A number of the steps in the process are used many times and in different orders, and many of the steps can be performed concurrently by separate groups of students. Each aspect listed in the chart applies not only to the major problem stated in the unit challenge but also to many of the tasks each small group undertakes while working on a solution to the major problem. Consequently, USMES students gain extensive experience with the problem-solving process.

The charts for mathematics, science, social science, and language arts identify the specific skills, processes, and areas of study that may be learned by students as they respond to an Eating in School challenge and become involved with certain activities. Because the students initiate the activities, it is impossible to state unequivocally which activities will take place. It is possible, however, to document activities that have taken place in USMES classes and identify those skills and processes that have been used by the students.

Knowing in advance which skills and processes are likely to be utilized in Eating in School and knowing the extent that they will be used, teachers can postpone the teaching

of those skills in the traditional manner until later in the year. If the students have not learned them during their USMES activities by that time, they can study them in the usual way. Further, the charts enable a teacher to integrate USMES more readily with other areas of classroom work. For example, teachers may teach fractions during math period when fractions are also being learned and utilized in the students' USMES activities. Teachers who have used USMES for several successive years have found that students are more motivated to learn basic skills when they have determined a need for them in their USMES activities. During an USMES session the teacher may allow the students to learn the skills entirely on their own or from other students, or the teacher may conduct a skill session as the need for a particular skill arises.

Because different USMES units have differing emphases on the various aspects of problem solving and varying amounts of possible work in the various subject areas, teachers each year might select several possible challenges, based on their students' previous work in USMES, for their class to consider. This choice should provide students with as extensive a range of problems and as wide a variety of skills, processes, and areas of study as possible during their years in school. The charts and lists on the following pages can also help teachers with this type of planning.

Some USMES teachers have used a chart similar to the one given here for real problem solving as a record-keeping tool, noting each child's exposure to the various aspects of the process. Such a chart might be kept current by succeeding teachers and passed on as part of a student's permanent record. Each year some attempt could be made to vary a student's learning not only by introducing different types of challenges but also by altering the specific activities in which each student takes part. For example, children who have done mostly construction work in one unit may be encouraged to take part in the data collection and data analysis in their next unit.

Following the rating charts are the lists of explicit examples of real problem solving and other subject area skills, processes, and areas of study learned and utilized in Eating in School. Like the charts, these lists are based on documentation of activities that have taken place in USMES classes. The greater detail of the lists allows teachers to see exactly how the various basic skills, processes, and areas of study listed in the charts may arise in Eating in School.

The number of examples in the real problem solving list have been limited because the list itself would be unreasonably long if all the examples were listed for some of the categories. It should also be noted that the example(s) in the first category--*Identifying and Defining Problems*--have been limited to the major problem that is the focus of the unit. During the course of their work, the students will encounter and solve many other, secondary problems, such as the problem of how to display their data or how to draw a scale layout.

Breaking down an interdisciplinary curriculum like USMES into its various subject area components is a difficult and highly inexact procedure. Within USMES the various subject areas overlap significantly, and any subdivision must be to some extent arbitrary. For example, where does measuring as a mathematical skill end and measurement as science and social science process begin? How does one distinguish between the processes of real problem solving, of science, and of social science? Even within one subject area, the problem still remains--what is the difference between graphing as a skill and graphing as an area of study? This problem has been partially solved by judicious choice of examples and extensive cross-referencing.

Because of this overlap of subject areas, there are clearly other outlines that are equally valid. The scheme presented here was developed with much care and thought by members of the USMES staff with help from others knowledgeable in the fields of mathematics, science, social science, and language arts. It represents one method of examining comprehensively the scope of USMES and in no way denies the existence of other methods.

REAL PROBLEM SOLVING	Overall Rating
Identifying and defining problem.	1
Deciding on information and investigations needed.	1
Determining what needs to be done first, setting priorities.	2
Deciding on best ways to obtain information needed.	1
Working cooperatively in groups on tasks.	1
Making decisions as needed.	1
Utilizing and appreciating basic skills and processes.	1
Carrying out data collection procedures--observing, surveying, researching, measuring, classifying, experimenting, constructing.	1
Asking questions, inferring.	1
Distinguishing fact from opinion, relevant from irrelevant data, reliable from unreliable sources.	1

REAL PROBLEM SOLVING	Overall Rating
Evaluating procedures used for data collection and analysis. Detecting flaws in process or errors in data.	1
Organizing and processing data or information.	1
Analyzing and interpreting data or information.	1
Predicting, formulating hypotheses, suggesting possible solutions based on data collected.	1
Evaluating proposed solutions in terms of practicality, social values, efficacy, aesthetic values.	1
Trying out various solutions and evaluating the results, testing hypotheses.	1
Communicating and displaying data or information.	1
Working to implement solution(s) chosen by the class.	1
Making generalizations that might hold true under similar circumstances; applying problem-solving process to other real problems.	1

KEY: 1 = extensive use, 2 = moderate use, 3 = some use, - = little or no use

MATHEMATICS	Overall Rating
Basic Skills	
Classifying/Categorizing	2
Counting	1
Computation Using Operations	
Addition/Subtraction	1
Multiplication/Division	1
Fractions/Ratios/Percentages	1
Business and Consumer Mathematics/ Money and Finance	2
Measuring	1
Comparing	3
Estimating/Approximating/Rounding Off	1
Organizing Data	1
Statistical Analysis	1
Opinion Surveys/Sampling Techniques	1
Graphing	1
Spatial Visualization/Geometry	2
Areas of Study	
Numeration Systems	1
Number Systems and Properties	1
Denominate Numbers/Dimensions	1
Scaling	1
Symmetry/Similarity/Congruence	3
Accuracy/Measurement Error/ Estimation/Approximation	1
Statistics/Random Processes/Probability	1
Graphing/Functions	1
Fraction/Ratio	1
Maximum and Minimum Values	3
Equivalence/Inequality/Equations	3
Money/Finance	2
Set Theory	3

SCIENCE	Overall Rating
Processes	
Observing/Describing	1
Classifying	2
Identifying Variables	2
Defining Variables Operationally	2
Manipulating, Controlling Variables/ Experimenting	2
Designing and Constructing Measuring Devices and Equipment	3
Inferring/Predicting/Formulating, Testing Hypotheses/Modeling	1
Measuring/Collecting, Recording Data	1
Organizing, Processing Data	1
Analyzing, Interpreting Data	1
Communicating, Displaying Data	1
Generalizing/Applying Process to New Problems	1
Areas of Study	
Measurement	1
Motion	2
Force	-
Mechanical Work and Energy	-
Solids, Liquids, and Gases	-
Electricity	-
Heat	3
Light	2
Sound	2
Animal and Plant Classification	-
Ecology/Environment	2
Nutrition/Growth	1
Genetics/Heredity/Propagation	-
Animal and Plant Behavior	-
Anatomy/Physiology	-

KEY: 1 = extensive use, 2 = moderate use, 3 = some use, - = little or no use

SOCIAL SCIENCE	Overall Rating
Process	
Observing/Describing/Classifying	1
Identifying Problems, Variables	1
Manipulating, Controlling Variables/ Experimenting	2
Inferring/Predicting/Formulating, Testing Hypotheses	1
Collecting, Recording Data/Measuring	2
Organizing, Processing Data	2
Analyzing, Interpreting Data	2
Communicating, Displaying Data	2
Generalizing/Applying Process to Daily Life	1
Attitudes/Values	
Accepting responsibility for actions and results	1
Developing interest and involvement in human affairs	1
Recognizing the importance of individual and group contributions to society	1
Developing inquisitiveness, self-reliance, and initiative	1
Recognizing the values of cooperation, group work, and division of labor	1
Understanding modes of inquiry used in the sciences, appreciating their power and precision	1
Respecting the views, thoughts, and feelings of others	1
Being open to new ideas and information	1
Learning the importance and influence of values in decision making	1
Areas of Study	
Anthropology	3
Economics	2
Geography/Physical Environment	3
Political Science/Government Systems	1
Recent Local History	3
Social Psychology/Individual and Group Behavior	3
Sociology/Social Systems	2

LANGUAGE ARTS	Overall Rating
Basic Skills	
Reading	
Literal Comprehension: Decoding Words, Sentences, Paragraphs	1
Critical Reading: Comprehending Meanings, Interpretation	2
Oral Language	
Speaking	1
Listening	1
Memorizing	3
Written Language	
Spelling	1
Grammar: Punctuation, Syntax, Usage	1
Composition	1
Study Skills	
Outlining/Organizing	1
Using References and Resources	1
Attitudes/Values	
Appreciating the value of expressing ideas through speaking and writing	1
Appreciating the value of written resources	1
Developing an interest in reading and writing	2
Making judgments concerning what is read	2
Appreciating the value of different forms of writing, different forms of communication	1

KEY: 1 = extensive use, 2 = moderate use, 3 = some use, - = little or no use

REAL PROBLEM SOLVING IN EATING IN SCHOOL

Identifying and Defining Problems	• Students identify long waiting times in the lunch lines as a problem in their school. • See also SOCIAL SCIENCE list: *Identifying Problems, Variables.*
Deciding on Information and Investigations Needed	• After a discussion students decide they need to time students waiting in line to find out how long they take to get through. • After analyzing lunch line times, students decide more data on different days and on different grade levels is needed. • Students decide that they need to try out different arrangements of items along the serving counter before deciding which arrangement is best.
Determining What Needs to Be Done First, Setting Priorities	• Students decide to observe the lunch line first and then to collect student times before trying to propose solutions.
Deciding on Best Ways to Obtain Information Needed	• Children decide that one student will operate the stopwatch and another will record when measuring student times to go through the lunch line. • Children conduct opinion surveys to find out whether others consider the lunch lines too long and to obtain suggestions for improvements. • Students decide to make a scale map of the serving area for comparing different arrangements of food and serving items. • Students decide to try out for a week each plan for rearranging items along the serving counter and to collect data on times to see which arrangement makes the line move the most quickly.
Working Cooperatively in Groups on Tasks	• Students form groups to collect data on student times to get through the lunch line, total time for everyone to get served, and to take measurements of items along the serving counter.

Making Decisions as Needed	• Students decide to work in groups so that more can be accomplished. • Students decide to time every fifth person in the line. • Students decide that rearranging the items along the serving counter is one way to solve the lunch line problem. • Students decide that having older grades go first would speed up the line. • Students decide to make a presentation to the principal to get approval to try out different serving arrangements and different schedules.
Utilizing and Appreciating Basic Skills and Processes	• Students use stopwatches to time students going through the lunch line. • Students try out different fractions of actual measurements to obtain measurements for scale layout. • Students recognize that improving the lunchroom will help other children in the school. • Students write clearly worded questions for opinion survey. • See also MATHEMATICS, SCIENCE, SOCIAL SCIENCE, and LANGUAGE ARTS lists.
Carrying Out Data Collection Procedures--Opinion Surveying, Researching, Measuring, Classifying, Experimenting, Constructing	• Students conduct opinion survey to find out whether others consider the lunch line too slow. • Students measure student times to get through the lunch line. • Students measure items on serving table to make a scale map of the serving area. • Students try out different arrangements of items on serving counter to find out which arrangement makes line move the most quickly. • Students try out different schedule of classes. • See also MATHEMATICS list: *Classifying/Categorizing; Measuring.* • See also SCIENCE list: *Observing/Describing; Classifying; Manipulating, Controlling Variables/Experimenting; Designing and Constructing Measuring Devices and Equipment; Measuring/Collecting, Recording Data.* • See also SOCIAL SCIENCE list: *Observing/Describing; Classifying; Manipulating, Controlling Variables/Experimenting; Collecting, Recording Data/Measuring.*

Asking Questions, Inferring

- Students ask whether other students feel that the lunch line moves too slowly and infer from data collected that they do.
- Students ask whether upper grades move faster through the line than lower grades. They infer from the data that they do.
- Students ask which of several alternative serving arrangements to recommend. They infer that the one that can allow students to pick up items the most quickly is the best.
- See also SCIENCE list: *Inferring/Predicting/Formulating, Testing Hypotheses/Modeling.*
- See also SOCIAL SCIENCE list: *Inferring/Predicting/Formulating, Testing Hypotheses.*

Distinguishing Fact from Opinion, Relevant from Irrelevant Data, Reliable from Unreliable Sources

- Students recognize the qualitative aspects of obtaining data from opinion surveys as distinct from data on length of time students wait in the lunch line.
- Students recognize that the practicality of arrangements of items along serving counter is determined better by those who serve the food than by students or teachers.

Evaluating Procedures Used for Data Collection and Analysis, Detecting Flaws in Process or Errors in Data

- Students evaluate the manner in which student times to go through lunch line were measured.
- Students discover that some times recorded are much too long.
- Students decide that using a tape measure is a faster way to measure distances in the serving line than a meter stick.
- Children decide that their opinion survey about lunch line problems needs improvement and they discuss changes that can be made.
- Children decide that they need to use a bigger sample for the opinion survey.
- See also MATHEMATICS list: *Estimating/Approximating/Rounding Off.*

Organizing and Processing Data

- Students order and group measurements of student times in the lunch line to draw histograms.
- See MATHEMATICS list: *Organizing Data.*
- See SCIENCE and SOCIAL SCIENCE lists: *Organizing, Processing Data.*

Analyzing and Interpreting Data	• Students find median time that students in each grade wait in the lunch line. • Students find that 86% of the people surveyed think they have to wait too long in the lunch line. • See MATHEMATICS list: *Comparing; Statistical Analysis; Opinion Surveys/Sampling Techniques; Graphing.* • See SCIENCE and SOCIAL SCIENCE lists: *Analyzing, Interpreting Data.*
Predicting, Formulating Hypotheses, Suggesting Possible Solutions Based on Data Collected	• Students hypothesize that the results of their sample survey reflect the opinions of all students. • After investigating, students predict that the lunch line will move faster if the items served (e.g., silverware, napkins, milk, etc.) are rearranged. • Students predict that the lunch line will move faster if older grades go first. • See also SCIENCE list: *Inferring/Predicting/Formulating, Testing Hypotheses/Modeling.* • See also SOCIAL SCIENCE list: *Inferring/Predicting/ Formulating, Testing Hypotheses.*
Evaluating Proposed Solutions in Terms of Practicality, Social Values, Efficacy, Aesthetic Values	• Students discuss advantages and disadvantages of proposed arrangements of items on the serving table and different lunch schedules in terms of practicality.
Trying Out Various Solutions and Evaluating the Results, Testing Hypotheses	• Students conduct trial runs of different arrangements of eating utensils and other serving items. • Students conduct a trial run of older grades going ahead of younger grades in the lunch line. • Children compare data collected during trial runs and decide which solution makes the line move fastest. • Students compare survey results from two samples of students. • See also SCIENCE list: *Inferring/Predicting/Formulating, Testing Hypotheses/Modeling.* • See also SOCIAL SCIENCE list: *Inferring/Predicting/ Formulating, Testing Hypotheses.*
Communicating and Displaying Data or Information	• Students draw histograms to show student times going through the lunch line. • Children draw a bar graph to show results of opinion survey.

Communicating and Displaying Data or Information (cont.)	• Students draw scale layout of serving area. • See MATHEMATICS list: *Graphing; Scaling.* • See SCIENCE and SOCIAL SCIENCE lists: *Communicating, Displaying Data.* • See also LANGUAGE ARTS list.
Working to Implement Solution(s) Chosen by the Class	• Students present principal with results of their experiments on various arrangements of items in the lunch line and on different schedule of classes.
Making Generalizations That Might Hold True Under Similar Circumstances; Applying Problem-Solving Process to Other Real Problems	• Students who have drawn graphs to display data on lunch line times may display data on other problems. • Students working on Eating in School apply skills acquired to work on other units. • See also SCIENCE list: *Generalizing/Applying Process to New Problems.* • See also SOCIAL SCIENCE list: *Generalizing/Applying Process to Daily Life.*

Basic Skills

Classifying/Categorizing	• Categorizing characteristics or properties of cafeteria foods or paints for decorating lunchroom walls. • Categorizing characteristics of foods in more than one way. • Organizing and classifying types of foods. • Distinguishing sets and subsets of types of foods, of survey data on food or decoration preferences. • Using the concepts and language of sets (subsets, unions, intersections, set notations) for planning menus according to student preferences. • See also SCIENCE list: *Classifying*. • See also SOCIAL SCIENCE list: *Observing/Describing/Classifying*.
Counting	• Counting votes to decide which lunchroom problems to work on first. • Counting survey data on preferences for wall design or foods. • Counting portions of foods thrown away. • Counting number of people in the lunch line. • Counting to read scales on thermometers, sound-level meters, or meter sticks. • Counting by sets to find scale for graph axes.
Computation Using Operations: Addition/Subtraction	• Adding one-, two-, or three-digit whole numbers to find total tally of food portions wasted or total length and width of lunchroom. • Adding or subtracting minutes and seconds when timing students going through the lunch line. • Subtracting one- or two-digit whole numbers to find ranges for graph axes or measurement data or to compare sets of data (e.g., food portions wasted before and after the menu has been changed).
Computation Using Operations: Multiplication/Division	• Multiplying whole numbers to find total tally of students passing through the lunch line, total measurement of room length. • Multiplying or dividing to find scale for graph axes.

Computation Using Operations: Multiplication/Division (cont.)	• Multiplying and dividing to convert from yards to feet and vice versa, meters to centimeters and vice versa. • Using multiplication and division to increase or decrease measurements for scale drawings. • Dividing to calculate average number of food portions wasted or average waiting time in the lunch line. • Dividing to find unit measure (e.g., weight of food in one portion, number of calories in one portion). • Dividing to calculate ratios, fractions, or percentages.
Computation Using Operations: Fractions/Ratios/Percentages	• Using mixed numbers to calculate dimensions for a scale drawing. • Changing fractions to higher or lower terms (equivalent fractions) to perform operations such as addition or subtraction. • Using ratios and fractions to convert from feet to yards, cups to quarts, etc. • Using ratios to increase or decrease measurements for a scale drawing or model of the lunchroom. • Using fractions in measurement, graphing, graphic comparisons, scale drawings or models. • Using slope diagrams to compare ratio of food portions wasted to total served. • Calculating actual measurements from scale drawings using ratio of scale drawing. • Calculating percentage of each ingredient in a recipe, percentage of students passing through the lunch line in a given time or less, percentage of students preferring one type of decoration, etc. • Using proportions to increase or decrease a recipe.
Computation Using Operations: Business and Consumer Mathematics/ Money and Finance	• Adding, subtracting, multiplying, and dividing dollars and cents to perform cost analyses on menu changes, lunchroom decorations, etc. • Investigating costs of equipment for lunchroom vs. use of equipment and budget restrictions. • Using comparison when shopping for foods. • Assessing cost benefit of quantity purchases.
Measuring	• Converting from inches to feet, pounds to ounces, cups to pints (quarts, gallons), and vice versa. • Using arbitrary units (e.g., children's feet) to measure lunchroom dimensions.

Measuring (cont.)	• Using different standard units of measure to measure lunchroom dimensions. • Measuring the ingredients in a recipe. • Reading stopwatches, VU-meters, scales, or meter sticks accurately. • Timing, using a clock, how long it takes everyone to get through the lunch line. • See also SCIENCE list: *Measuring/Collecting, Recording Data.* • See also SOCIAL SCIENCE list: *Collecting, Recording Data/Measuring.*
Comparing	• Using the concept of *greater than* and *less than* in making comparisons of ingredients for recipes, noise levels, etc. • Comparing measurements obtained by using a meter stick and a tape measure. • Comparing qualitative information, such as people's observations and opinions, gathered from various sources. • Comparing qualitative data gathered from a food preference survey with quantitative data gathered from tallying amounts of food waste. • Comparing estimated and actual results of sound level measurement. • Making graphic comparisons of times to go through the lunch line. • Making graphic comparisons of percentages of food portions wasted for different foods. • Comparing costs of different food items. • See also SCIENCE list: *Analyzing, Interpreting Data.* • See also SOCIAL SCIENCE list: *Analyzing, Interpreting Data.*
Estimating/Approximating/ Rounding Off	• Estimating error in results of opinion surveys on hot lunch program. • Estimating the number of people who will buy lunch on a given day, who will not eat a particular item served, etc. • Estimating sound measurements, food costs, amount of paint necessary for decoration, etc. • Estimating placement of menus or decorative posters on walls by eyeballing. • Determining when a measurement of lunchroom distance or sound intensity is likely to be accurate enough for a particular purpose.

Estimating/Approximating/ Rounding Off (cont.)	• Using approximation in constructing scale layouts of the lunchroom. • Rounding off measurements while measuring length, amount of food wasted, etc. • Rounding off data after measuring dimensions of the room and tables.
Organizing Data	• Tallying on bar graphs, histograms. • Ordering numbers on graph axis. • Ordering the steps in a process. • Ordering survey results on opinions about a lunchroom problem. • Ordering inches, feet, yards; meters, centimeters; cups, pints, quarts, gallons. • See also SCIENCE list: *Organizing, Processing Data.* • See also SOCIAL SCIENCE list: *Organizing, Processing Data.*
Statistical Analysis	• Finding the median in an ordered set of data on times for waiting in the lunch line. • Finding quartiles from ordered data or histogram of lunch line waiting times. • Determining the interquartile range of data on lunch line waiting times. • Finding the average number of portions of food thrown away for each food group (e.g., vegetable, main dish, etc.). • Taking repeated measurements of lunchroom distances and using the median measurement. • Finding and comparing medians and modes of data on sound levels. • Determining the range of data on sound level. • See also SCIENCE list: *Analyzing, Interpreting Data.* • See also SOCIAL SCIENCE list: *Analyzing, Interpreting Data.*
Opinion Surveys/Sampling Techniques	• Conducting surveys on food and decoration preferences; defining data collection methods and the makeup and size of sample. • Devising methods of obtaining quantitative information about subjective opinions, such as students' feelings about lunch. • Evaluating survey methodology, administration of survey, size and makeup of samples.

Opinion Surveys/Sampling Techniques (cont.)	• See also SCIENCE list: *Analyzing, Interpreting Data.* • See also SOCIAL SCIENCE list: *Analyzing, Interpreting Data.*

Graphing	• Using alternative methods of displaying data, e.g., charts, graphs.
	• Making a graph form--dividing axes into parts, deciding on an appropriate scale.
	• Representing data on graphs.
	  • Bar graph--number of students preferring different mural designs.
	  • Conversion graph--plotting feet vs. yards.
	  • Cumulative frequency graph--times for students going through lunch lines.
	  • Histogram--number of students going through lunch line in different times.
	  • Line chart--number of portions of foods wasted on different days.
	  • Q-Q graph--plotting times to go through lunch line before and after changes.
	  • Scatter graph--plotting food wasted vs. preference ratings.
	  • Slope diagram--plotting food wasted vs. total served.
	• See also SCIENCE list: *Communicating, Displaying Data.*
	• See also SOCIAL SCIENCE list: *Communicating, Displaying Data.*

Spatial Visualization/Geometry	• Drawing or constructing a layout or model of the lunchroom. • Using standard measurational formulas, e.g., A = L x W (Area = Length x Width). • Measuring and constructing a scale layout using rulers and protractors. • Using spatial arrangements to convey information on the best furniture arrangement for the lunchroom. • Making a flow diagram of traffic patterns in the lunchroom.
Areas of Study	
Numeration Systems	• Using the decimal system in making metric measurements of room dimensions.

Numeration Systems (cont.)	• Using fractions in measuring inches or teaspoons, cups, etc. • Using decimal system in calculating costs of foods or materials for decoration.
Number Systems and Properties	• See *Computation Using Operations*.
Denominate Numbers/Dimensions	• See *Measuring*.
Scaling	• Deriving information from scale drawings of the lunchroom and furniture. • Finding an appropriate scale (proportion) for the scale drawing. • Using a scale to draw and make representations in the scale drawing. • Making a scale map of the lunchroom.
Accuracy/Measurement Error/ Estimation/Approximation	• See *Measuring* and *Estimating/Approximating/Rounding Off*.
Statistics/Random Processes Probability	• See *Statistical Analysis*.
Graphing/Functions	• See *Graphing*.
Fraction/Ratio	• See *Computation Using Operations: Fractions/Ratios/ Percentages*.
Maximum and Minimum Values	• Minimizing space and cost in recommending lunchroom equipment or furniture. • Finding the foods that are the most popular for the highest nutritional value and the least cost.
Equivalence/Inequality/Equations	• See *Comparing* and *Computation Using Operations*.

Money/Finance

• See *Computation Using Operations: Business and Consumer Mathematics/Money and Finance.*

Set Theory

• See *Classifying/Categorizing.*

ACTIVITIES IN EATING IN SCHOOL UTILIZING SCIENCE

Process

Observing/Describing	• Observing that many children have to wait a long time in line. • Observing that noise from the lunchroom disturbs other classes. • Observing that many children throw away the same food(s). • See also SOCIAL SCIENCE list: *Observing/Describing/Classifying*.
Classifying	• Categorizing foods according to food type, basic groups, nutrient content, etc. • Classifying the various noises in the room that annoy people. • See also MATHEMATICS list: *Classifying/Categorizing*. • See also SOCIAL SCIENCE list: *Observing/Describing/Classifying*.
Identifying Variables	• Identifying noise level, amount of food wasted, and length of waits in the lunch line, as things to measure in order to make lunch more enjoyable. • Identifying time and location of sound measuring device as things to be controlled when measuring noise. • Identifying arrival time of classes as a variable that could be changed to reduce length of lunch line. • Identifying nutrients necessary in a balanced meal. • See also SOCIAL SCIENCE list: *Identifying Problems, Variables*.
Defining Variables Operationally	• Defining noise level as the VU-meter reading on a tape recorder when the volume is set at five. • Defining time in line as the time interval between the time a student joins the line and the time he/she has a tray of food. • Defining portion of food wasted as one-half or more of the portion being thrown away. • Defining an adequate food portion as one sufficient to meet state requirements.

Manipulating, Controlling Variables/ Experimenting	• Keeping the volume of the tape recorder and the placement of the tape recorder the same each time the noise level is measured. • Designing and conducting experiments to compare sound-proofing ability of different materials. • Measuring lunch line flow at different times and when different lunches are served. • Designing menus that meet state requirements and include foods preferred by students. • See also SOCIAL SCIENCE list: *Manipulating, Controlling Variables/Experimenting.*
Designing and Constructing Measuring Devices and Equipment	• Constructing devices to measure sound levels in various parts of the room.
Inferring/Predicting/Formulating, Testing Hypotheses/Modeling	• Inferring from the data collected that the lunch line moves too slowly. • Predicting that the noise level is higher when older students are in the lunchroom. • Hypothesizing that a staggered schedule for classes or a different arrangement of items on the serving counter will improve lunch line flow. Trying out the suggested schedule or arrangement. • Designing simulations to try out different arrangements in the serving line. • Choosing the best method of filing through the lunch line based on speed and convenience. • See also SOCIAL SCIENCE list: *Inferring/Predicting/ Formulating, Testing Hypotheses.*
Measuring/Collecting, Recording Data	• Using a sound level device to measure noise every five minutes and recording the readings on a chart. • Measuring and recording the length of time a sample of students spend waiting in line. • Measuring the lunchroom and tables before constructing a scale layout to determine the best arrangement of tables. • Researching information on food requirements. • See also MATHEMATICS list: *Measuring.* • See also SOCIAL SCIENCE list: *Organizing, Processing Data.*

Organizing, Processing Data	• Ordering data on lunch line times and on noise levels from smallest to largest. • Tabulating measurements of the room and furniture before making a scale layout. • See also MATHEMATICS list: *Organizing Data.* • See also SOCIAL SCIENCE list: *Organizing, Processing Data.*
Analyzing, Interpreting Data	• Finding the median or average waiting time and noise level each day. • Calculating the average sound level in each part of the lunchroom for the entire week. • Determining that particular menus will provide a balanced diet. • Determining that the present schedule of classes leads to long times spent in line. • Determining that noise levels are higher at certain times. • See also MATHEMATICS list: *Comparing; Statistical Analysis; Opinion Surveys/Sampling Techniques; Graphing, Maximum and Minimum Values.* • See also SOCIAL SCIENCE list: *Analyzing, Interpreting Data.*
Communicating, Displaying Data	• Showing data on various types of graphs. • Showing seating problems and proposed new layouts on a scale map of the lunchroom. • See also MATHEMATICS list: *Graphing.* • See also SOCIAL SCIENCE list: *Communicating, Displaying Data.* • See also LANGUAGE ARTS list.
Generalizing/Applying Process to New Problems	• Applying skills learned from working on a lunchroom problem to help solve a classroom problem. • Using knowledge acquired from working on one aspect of the lunchroom to help solve other lunchroom problems. • See also SOCIAL SCIENCE list: *Generalizing/Applying Process to Daily Life.*
Areas of Study	
Measurement	• Investigating different amounts of foods prepared based on lunch counts.

Measurement (cont.)	• Investigating amounts of essential nutrients (carbohydrates, proteins, fats, vitamins, minerals) in various foods. • Measuring surface area of table needed by each student to eat lunch, or surface area of wall that needs to be painted. • See also *Designing and Constructing Measuring Devices and Equipment*. • See also MATHEMATICS list: *Measuring*.
Force	• Observing that force must be exerted to use a hand saw. • Observing that saber saws are faster and require less effort to operate than hand saws when cutting Tri-Wall or lumber.
Friction	• Observing that children easily slip on wet floors where food has been spilled because smooth surfaces generate less friction than rough ones. • Observing that a blade becomes warmer when a piece of Tri-Wall or wood is sawed vigorously because doing work against the force of friction generates heat.
Weight	• Noting that weight is a measure of gravity, which pulls objects towards the earth, when weighing foods on a balance.
Mechanical Work and Energy	• Observing that using hand saws requires energy. • Observing that electrical energy is transformed into mechanical energy when power tools are used. • See also *Force*.
Solids, Liquids, and Gases	
States of Matter	• Observing that heat from a warmed roll turns butter from a solid to a liquid form. • Noting that some solid food substances (e.g., salt, sugar, jello) may be turned into liquids when dissolved in water. • Observing that milk or juice kept in a freezer that is too cold will contain ice crystals.

Properties of Matter	• Observing that different construction materials such as lumber and Tri-Wall have different properties that make them useful for different tasks. • Observing that paper materials available for making posters and other decorations have different colors and different weights. • Observing, while mixing tempera paints or dyes, that the dry powder mixes uniformly with water. • Observing that different types of food have different odors and different tastes. • Observing that foods smell and taste different when uncooked than when cooked, or when separate than when combined in a recipe. • Observing that frozen, fresh, and canned vegetables taste different. • Observing that the individual weights of wet and dry food ingredients equal the weight of the ingredients when combined.
Electricity	• Observing that plugging in the tape recorder enables the equipment to be turned on. • Observing that tape recorders, saber saws, and other electrically powered devices go on when the switch is closed and go off when the switch is open. • Observing that electricity can be transformed into mechanical energy (tape recorder, saber saw), or into heat energy (glue gun, oven).
Heat/Temperature	• Observing and measuring changes in temperature by reading a homemade or commercial thermometer. • Observing that some machines (such as a stove or oven) generate heat when turned on as electrical energy is transformed to heat energy. • Noting that people's bodies give off heat, which is a product of the process of assimilating food into the body.
Light	• Observing that paints and papers come in different colors, caused by the reflection of light of a given color and the absorption of light of other colors by the pigment in the paint or paper. • Observing that murals, posters, and other decorations may be more effective if the colors are bright and contrasting.

Light (cont.)	• Observing that the side of the lunchroom nearest the window is brighter than the rest of the room and that the intensity of illumination decreases as the distance from the light source increases.
Sound	• Assessing or measuring noise levels using professional sound-level meters or tape-recorder meters. • Observing that noise from the lunchroom can sometimes be heard in an adjacent room. • Observing that some of the electrical energy supplied to power tools is transformed into sound energy (noise). • Observing that sounds differ in tone, pitch, loudness, and quality. • Observing that noise levels in the lunchroom are lower when curtains or acoustical barriers are used to absorb the sound. • Observing that a sound becomes less intense as it moves away from its source. • Observing that sound readily travels around objects. • Observing that different materials absorb sound to different degrees. Solid, dense materials tend to transmit sound well. Soft or porous materials tend to make better soundproofing because they absorb sound.
Nutrition/Growth	• Observing that most people eat both animal and plant foods, which are considered necessary for healthy growth. growth. • Observing that school menus are designed to be balanced, i.e., to include foods from various food groups containing specific nutrients and vitamins. • Noting that certain foods, such as candy and soft drinks, are sometimes prohibited at school because, although they are high in calories, they also have little nutritional value. • Finding basic nutrient content of specific foods by consulting manuals on diet and nutrition. • Observing that a full, balanced meal makes an individual feel better and work better. • Observing, over a long time period, that eating nutritional foods improves health and growth.

Anatomy/Physiology

- Observing that some children need more food than others because their bodies use up more energy (i.e., their basal metabolic rate is higher).
- Noting that some people store more food (in the form of fat) than others.
- Noting that it is sometimes difficult to play energetically after a full meal because of the digestive process.
- Noting that people usually have more energy a few hours after eating a meal, as nutrients are absorbed into the body and used for body processes.

ACTIVITIES IN EATING IN SCHOOL UTILIZING SOCIAL SCIENCE

Process

Observing/Describing/Classifying	• Observing actions of students during lunch period. • Organizing and classifying types of foods, mural designs, lunchroom noises. • Observing and describing effects of distasteful foods, unpleasant surroundings, or physical disturbances in the lunchroom. • See also MATHEMATICS list: *Classifying, Categorizing.* • See also SCIENCE list: *Observing/Describing; Classifying.*
Identifying Problems, Variables	• Identifying problems--distasteful foods, unpleasant surroundings, physical disturbances--of students eating lunch or breakfast at school. • Identifying different attitudes children have towards lunch. • Identifying foods offered, preparation of foods, time to eat as variables affecting wastage of food. • Identifying amount and type of decorations as variables that could be changed to make surroundings more pleasant. • See also SCIENCE list: *Identifying Variables.*
Manipulating, Controlling Variables/Experimenting	• Changing only one variable at a time to determine effect on wastage of food, or attitude towards lunch. • Conducting opinion surveys after different lunches or under different conditions to see if there is a change in behavior of students. • See also SCIENCE list: *Manipulating, Controlling Variables/Experimenting.*
Inferring/Predicting/Formulating, Testing Hypotheses	• Inferring from observations and data collected on food wastage that some foods are not popular. • Inferring from results of opinion surveys on a sample of students the types of foods or decorations that should be obtained. • Hypothesizing from survey data that if certain preferred foods could be served more often while other unpopular foods were served less often, less food would be wasted.

Inferring/Predicting/Formulating, Testing Hypotheses (cont.)	• Hypothesizing that the results of a survey on a sample of students reflect the opinions of all students. • See also SCIENCE list: *Inferring/Predicting/Formulating, Testing Hypotheses.*
Collecting, Recording Data/ Measuring	• Using voting procedure to determine preferences. • Administering an opinion survey on food and decoration preferences. • See also MATHEMATICS list: *Counting; Measuring.* • See also SCIENCE list: *Measuring/Collecting, Recording Data.*
Organizing, Processing Data	• Tallying votes to determine which problem to work on. • Tallying questionnaire data on opinions about foods or other lunchroom problems. • See also MATHEMATICS list: *Organizing Data.* • See also SCIENCE list: *Organizing, Processing Data.*
Analyzing, Interpreting Data	• Comparing qualitative information gathered from interviews with various people. • Determining foods preferred by using a rating scale on survey results. • Evaluating survey methodology, size and makeup of sample. • See also MATHEMATICS list: *Comparing; Statistical Analysis; Opinion Surveys/Sampling Techniques.* • See also SCIENCE list: *Analyzing, Interpreting Data.*
Communicating, Displaying Data	• Representing survey data, such as preferences about foods or wall designs, on graphs or charts. • See also MATHEMATICS list: *Graphing.* • See also SCIENCE list: *Communicating, Displaying Data.* • See also LANGUAGE ARTS list.
Generalizing/Applying Process to Daily Life	• Using knowledge acquired from taking opinion surveys on cafeteria food to help solve other problems where attitudes are important. • Using knowledge acquired to improve personal eating habits, to aid in family meal planning. • Using knowledge acquired from publicizing lunchroom rules to get people concerned about other problems in the school.

Generalizing/Applying Process to Daily Life (cont.)	• See also SCIENCE list: *Generalizing/Applying Process to New Problems.*
Attitudes/Values	
Accepting Responsibility for Actions and Results	• Making sure that various tasks (e.g., measuring the lunchroom, administering surveys, finding out about nutritional regulations) are done. • Scheduling and giving presentations to persons in authority (principal, dietician, or cafeteria supervisor).
Developing Interest and Involvement in Human Affairs	• Promoting changes in the lunchroom.
Recognizing the Importance of Individual and Group Contributions to Society	• Recognizing that their improvement of the lunchroom will help not only themselves but the whole school. • Assessing the effects of group action on school regulations.
Developing Inquisitiveness, Self-Reliance, and Initiative	• Conducting group sessions with help from the teacher. • Finding solutions to problems encountered in addition to the main problem of the challenge. • Using the telephone to find out about regulations that might affect plans to improve lunch. • Choosing and developing the best way of presenting a plan to the principal or cafeteria supervisor.
Recognizing the Values of Cooperation, Group Work, and Division of Labor	• Finding that work on improving lunch or breakfast progresses more rapidly and smoothly when work is done in groups. • Eliminating needless overlap in work. • Finding that work is fun when people cooperate.
Understanding Modes of Inquiry Used in the Sciences; Appreciating Their Power and Precision	• Using scientific modes of inquiry to investigate and solve lunchroom problems. • Using data, graphs, and other supportive material to convince other people that their proposed solution is a good one. • Seeing that various lunchroom arrangements can be tried by using scale layouts. • See also MATHEMATICS and SCIENCE lists.

Respecting the Views, Thoughts, and Feelings of Others	• Considering all suggestions and assessing their merits. • Considering the opinions of others when proposing a change in the food, room decor, rules, etc. • Recognizing and respecting differences in values according to age, experience, occupation, income, interests, culture, race, religion, ethnic background. • Respecting the thoughts, interests, and feelings of members of the opposite sex when working in groups.
Being Open to New Ideas and Information	• Considering alternative ways of doing various tasks. • Conducting library research on nutrition, soundproofing, government regulations, etc. • Asking other people for opinions, ideas, and information.
Learning the Importance and Influence of Values in Decision-Making	• Recognizing that cost effectiveness alone is not sufficient in considering a solution; effects on people must also be considered. • Realizing that food preferences reflect the tastes of each individual. • Recognizing that dietary experts and students have different values that affect their preferences for serving foods and that both must be considered in the solution.
Areas of Study	
Anthropology	• Observing and describing differences in food preferences related to cultural and geographic background.
Economics	• Using concepts and terms, for example, cost, wholesale price, discount, etc., when examining foods that are purchased in the cafeteria. • Gaining experience with finance: sources, uses, and limitations of revenues for the purchase of foods, cafeteria furniture, etc. • Gaining experience with and assessing the value of comparative shopping for foods, taking inventory, record keeping, quantity purchasing, and quality control when running a school meal program.

Geography/Physical Environment	• Investigating and changing the physical environment in the lunchroom. • Investigating differences in foods grown in contrasting environments or climates.
Political Science/Government Systems	• Investigating systems of cafeteria administration and control; deciphering roles of governing persons over the student body. • Investigating lunchroom rules and regulations. • Helping to set up a system for enforcing lunchroom rules. • Working with school system authorities to discuss improvements in the cafeteria or food program. • Finding the most effective way to influence decision making about eating in school.
Recent Local History	• Investigating previous attempts to improve cafeteria food, decor, furniture arrangement, etc.
Social Psychology/Individual and Group Behavior	• Recognizing and using different ways of approaching different groups, such as students and administrators. • Recognizing need for leadership within small and large groups. Recognizing differing capacities of individuals for various roles within groups. • Analyzing the effects of a small group making decisions for a larger group.
Sociology/Social Systems	• Considering the integral, related nature of the school community and its physical surroundings as a factor in the problem of making the lunchroom a better place. • Devising a system of working cooperatively in small and large groups. • Investigating problems and making changes that affect not only themselves, but society (other students in the school, cafeteria workers). • Working within established social systems to promote changes within the lunchroom. • Experiencing and understanding differences in social systems in different social groups (children, adults, women, men, homemakers). • Recognizing that there are many different social groups and that one person belongs to more than one social group.

ACTIVITIES IN EATING IN SCHOOL UTILIZING LANGUAGE ARTS

Basic Skills

Reading: Literal Comprehension--Decoding Words, Sentences, and Paragraphs	• Decoding words, sentences, and paragraphs while reading books on nutrition or sound; while reading regulations on lunch and breakfast programs.
Reading: Critical Reading--Comprehending Meanings, Interpretation	• Obtaining factual information about nutrition, sound, state and federal regulations, etc. • Understanding what is read about nutrition, sound, regulations, etc. • Interpreting what is read, such as rules and regulations, sound and nutrition concepts, etc.
Oral Language: Speaking	• Offering ideas, suggestions, and criticisms during discussions in small group work and class discussions on problems and proposed solutions. • Reporting to class about data collection, scale-drawing activities, graphing, etc. • Responding to criticisms of activities. • Preparing, practicing, and giving an effective oral presentation to principal and/or cafeteria supervisor requesting improvements in the menu or permission to change the lunchroom. • Using the telephone properly and effectively to obtain information or to invite a resource person to speak to the class. • Conducting opinion surveys on food or lunchroom problems. • Using rules of grammar in speaking.
Oral Language: Listening	• Conducting interviews of other children, dietary experts, school and government administrators. • Following spoken directions. • Listening to group reports.
Oral Language: Memorizing	• Memorizing portions of oral presentations on a food or lunchroom problem and proposed solutions.

Written Language: Spelling	• Using correct spelling in writing reports, letters to authorities, posters of cafeteria rules.
Written Language: Grammar--Punctuation, Syntax, Usage	• Using rules of grammar in writing reports, letters, rules.

Written Language: Composition	• Writing to communicate effectively:
	  • preparing written reports and letters using notes, data, graphs, etc., communicating need for proposed lunchroom changes.
	  • writing posters for the lunchroom.
	  • writing opinion surveys for other children; devising questions to elicit desired information; judging whether a question is relevant and whether its meaning is clear.

Study Skills: Outlining/Organizing	• Taking notes when consulting authorities or books about sound, nutrition, regulations, etc. • Developing opinion survey; ordering questions around central themes, such as food preferences. • Planning presentations, data collection schemes, etc. • Planning and preparing drafts of letters, reports for critical review by the class. • Organizing ideas, facts, data for inclusion in letters, reports, presentations, etc.
Study Skills: Using References and Resources	• Using the library to research information on nutrition, sound, regulations, etc. • Using dictionary and encyclopedia to locate information. • Using indices and tables of contents of books to locate desired information. • Inviting an expert on nutrition or noise pollution to speak to the class and answer questions. • Using "How To" Cards for information on graphing, using a stopwatch, scale drawings, etc.

Attitudes/Values

Appreciating the Value of Expressing Ideas Through Speaking and Writing	• Finding that classmates and teacher may approve of an idea if it is presented clearly. • Finding that school officials may be persuaded to approve proposed changes or to incorporate them into their plans.
Appreciating the Value of Written Resources	• Finding that certain desired information can be found in books on sound, nutrition, etc.
Developing an Interest in Reading and Writing	• Willingly looking up information on regulations, nutrition, sound, etc. • Looking up more detailed information. • Showing desire to work on drafting letters, reports, surveys.
Making Judgments Concerning What is Read	• Deciding whether what is read is applicable to the particular problem. • Deciding how reliable the information obtained from reading is. • Deciding whether the written material is appropriate, whether it says what it is supposed to say, whether it may need improvement.
Appreciating the Value of Different Forms of Writing, Different Forms of Communication	• Finding that how information can be best conveyed is determined in part by the audience to whom it is directed. • Finding that certain data or information can be best conveyed by writing it down, preparing graphs or charts, etc. • Finding that certain data or information should be written down so that it can be referred to at a later time. • Finding that spoken instructions are sometimes better than written instructions, and vice versa.